# 2006 Annual Report

# Forest Health in Alberta

ERRATUM:
Replace Page 13 in report with this page.
Figure 6 was incorrect.



***Table 3***
The extent of spruce budworm defoliation by severity categories in northwestern Alberta, 2005 vs. 2006

| Forest Area | Net Defoliation (hectares) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | | |
| | Moderate | Severe | Total | Moderate | Severe | Total | Change* |
| Lesser Slave | 268 | 0 | 268 | 7248 | 576 | 7824 | 2819% |
| Upper Hay | 4788 | 3384 | 8172 | 6060 | 2283 | 8343 | 2.1% |
| Total | 5056 | 3384 | 8440 | 13,308 | 2859 | 16,167 | 91.6% |

* percent changes of defoliated area totals between 2005 and 2006

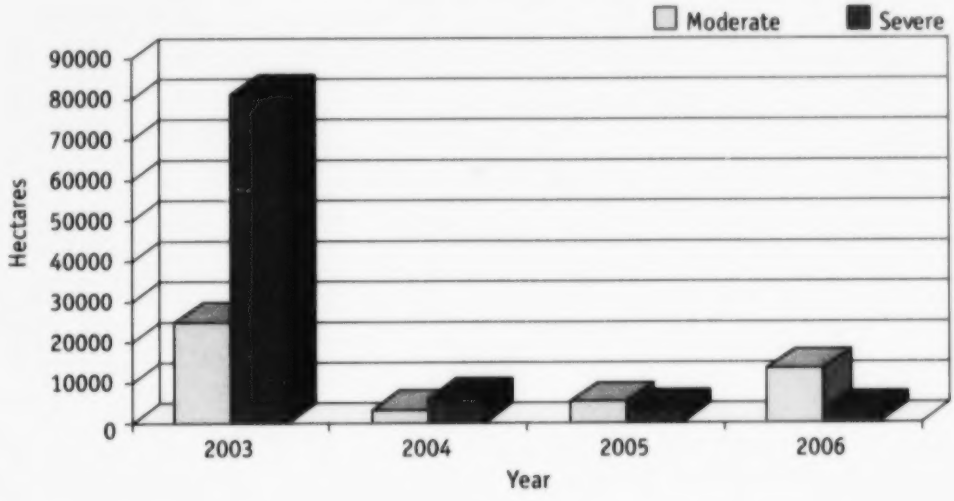


***Figure 6***
Net number of budworm-defoliated hectares by severity categories in northwestern Alberta, 2003-2006.

Figure 6 shows that spruce budworm populations collapsed in this region in 2005. However, in 2006 the defoliated area nearly doubled that of 2005. This is due to a nearly 30-fold increase in the extent of defoliation in the Lesser Slave Area. The extent of defoliation in the Upper Hay Area in 2006 remained about the same as in 2005. The continued use of pheromone-baited traps to monitor moth population levels in "hot spots" of this region is recommended.

Southwest Alberta

There were no reports of spruce budworm defoliation in this region in 2006.

**Provincial Parks and Protected Areas**

Cypress Hills Inter-Provincial Park

Extensive, moderate and severe spruce budworm defoliation was observed in the southwest area of the

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# 2006 Annual Report

# Forest Health in Alberta

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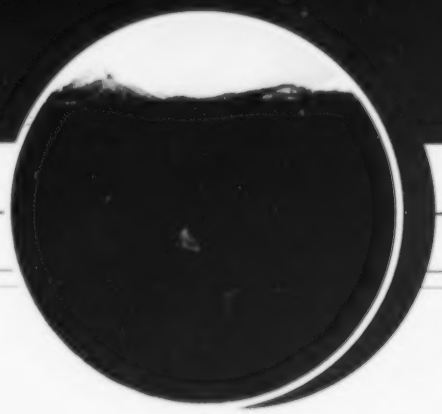

Sunil Ranasinghe, Forest Entomologist, compiled this report based on reports submitted by the Forest Health Officers (Mike Maximchuk, Tom Hutchison, Christie Ward, Brooks Horne and Mike Undershultz); Forest Officer, Cypress Hills Inter-Provincial Park (Les Weekes); Coordinator, STOPDED Society (Janet Feddes-Calpas) and Biological Sciences Technicians (Mike Jenkins and M. Wartenbe) of Community Services of the City of Edmonton.

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**Northeast Forest Health Program**

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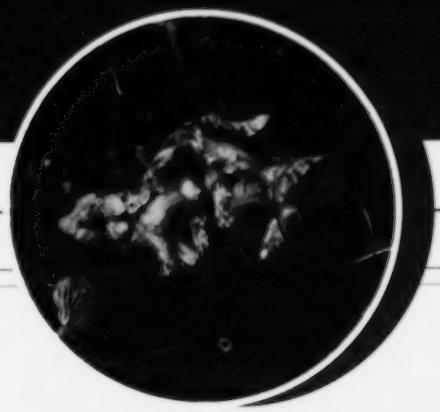
# Executive Summary



This annual report contains information on forest insect pests, diseases and alien invasive plants monitored on forested Crown land of Alberta in 2006. Reported here are the details of pest infestation surveys; forest pest and invasive plant management programs; and forest health training, increased awareness, and research and development carried under the Sustainable Resource Development's Forest Health Program in 2006.

Below is a summary of the extent of major forest pest infestations surveyed in 2006:

| Pest Species | Extent of Infestation |
|---|---|
| Spruce budworm | 21,183 ha of net area and 15,588 ha gross area |
| Mountain pine beetle | 13,856 trees attacked (August 2006 - July 2006) Estimated over million trees attacked (Aug./Sept. 2006) |
| Aspen defoliators | 5,851,155 ha of gross area |

Spruce budworm defoliation on forested Crown land increased from an estimated 13,389 hectares in 2005 to 36,771 hectares in 2006. The severity of defoliation also increased during this period. In 2006, the western spruce budworm again defoliated Douglas fir stands in the Porcupine Hills in southern Alberta.

The yellowheaded spruce sawfly defoliated spruce plantations growing on reclaimed oil and gas sites in northeast Alberta. In addition, this pest defoliated white spruce in Cypress Hills Inter-Provincial Park and in the City of Edmonton.

Between 2005 fall and 2006 summer, aerial and ground surveyors detected mountain pine beetle activity in Bow Valley, Crowsnest Pass, Cypress Hills Inter-Provincial Park, Kakwa Wildland Provincial Park and surrounding area, Oldman River, Spray Lakes and Willmore Wilderness Park. Infestations also occurred in Banff and Jasper national parks. A major influx of mountain pine beetles into Alberta in the summer of 2006 exponentially increased the infestations that could result in over a million trees infested.

The forest tent caterpillar-caused defoliation was scattered over a gross area of about five million hectares, mainly in northwest Alberta. Compared to 2005, the large aspen tortrix-caused defoliation significantly decreased in 2006 but was still persistent in southern Alberta. In 2006, aspen two-leaf tier was less widespread than in 2005 in northeast Alberta. No gypsy moths were trapped in 2006 in pheromone-baited traps deployed by Sustainable Resource Development on behalf of the Canadian Food Inspection Agency.

A spruce needle rust infection was reported over white spruce stands in the Foothills Area, including Switzer Provincial Park. Snow storms caused substantial damage to forest stands in Cypress Hills Inter-Provincial Park.

Several species of defoliators and bark beetles affected the urban forest in Edmonton. The smaller European elm bark beetles (SEEBB), a vector of Dutch elm disease (DED), continued to be trapped in the province in 2006. In spite of this Alberta remained free of DED. However, a similar vascular wilt disease affected elm trees in the City of Edmonton. Edmonton also lost many ash trees due to drought.

Under the mountain pine beetle management program, the Forest Management Branch Directive 2006-06 prohibiting importation of pine wood and wood products with bark was developed and implemented as a preventive measure. The Forest Health Officers conducted several information sessions to increase the public's awareness of mountain pine beetle. Under this management program carried out from 2005 September through 2006 August 12,938 infested pines were removed from forested Crown land, provincial parks and wilderness areas.

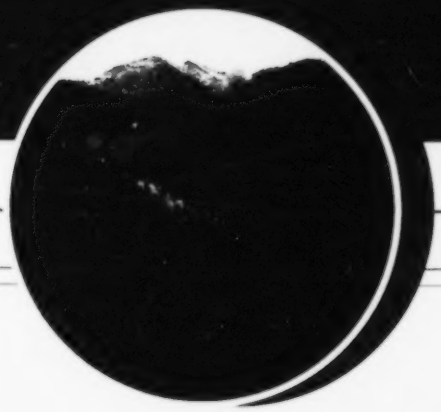
As a member of an interdepartmental invasive alien species working group, Sustainable Resource Development continued to develop a risk management framework on invasive species. Regionally, increased education and awareness, detection and control programs received priority under invasive plant species management programs.

A huge influx of mountain pine beetles from British Columbia into Alberta occurred in 2006 summer and will result in a massive increase in the number of faders in northern Alberta in 2007. The rate of spread of the beetle infestation will vary in different parts of the province. Based on the pheromone trap catches in 2006, new spruce budworm infestations are expected in northeast Alberta in 2007; similarly, a two-year cycle budworm outbreak is expected in southwest Alberta in 2008. The forest tent caterpillar infestations are expected to spread further into northeast Alberta in 2007.

The Forest Health Section published an annual report and a quarterly newsletter to increase forest health awareness. The Forest Health Section organized the 10th annual Integrated Forest Pest Management Forum and participated in the 14th Alberta/British Columbia Intermountain Forest Health Workshop. The forest health web site was regularly updated.

In 2006, the Forest Health Section supported several research projects on mountain pine beetle detection, impacts and management.

# Introduction



This is a report on forest insect and disease pests, and invasive alien plants (weeds) monitored on forested Crown land in Alberta in 2006. This report contains historical trends, pest conditions in 2006 and forecasts on occurrence of major forest pest infestations in 2007. The details of forest pest management programs carried out in 2006 are also reported here. In addition, this report presents information on Forest Health programs carried out to increase awareness, provide training, conduct field research and develop technology.

Tree health on forested Crown land is within the mandate of Sustainable Resource Development. This mandate is carried out by effective detection and monitoring of forest pests, and by implementing pest management strategies that promote forest sustainability and recognize joint responsibility with forest industry. The forest health program of Alberta is administered and coordinated by the provincial headquarters of Sustainable Resource Development. In 2006, the Forest Health Officers managed operational aspects of forest health programs. The Forest Areas[1] (Appendix I) delivered these programs.

Managing tree health issues on national parks and native Indian reserves in the province is a federal responsibility. Tree health in provincial parks and protected areas is within the mandate of the Department of Tourism, Parks, Recreation and Culture. The municipal governments, private landowners and Metis settlements look after tree health on their respective lands.

In this report the details of the mountain pine beetle management program are reported on a "beetle year" basis, i.e., beginning soon after the beetle flights in 2005 summer and ending with the beetle flight in 2006 summer. These program details include the results of the pheromone-based monitoring program, aerial overview surveys carried out in 2005 and 2006, ground surveys in 2005 and the resulting beetle management program that was carried out through the winter and spring/early summer of 2006. This approach enables us to report on events related to the same generation of beetles.

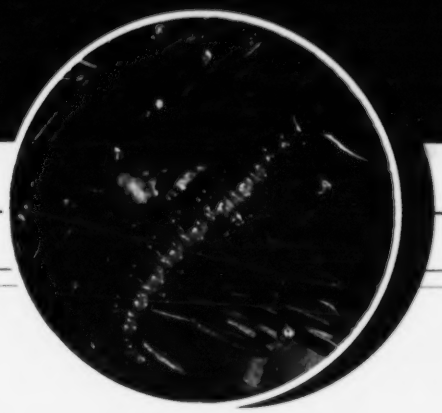
However, results of the 2006 pheromone-based monitoring program are briefly discussed in relation to forecasts on mountain pine beetle occurrence in 2007.

Many other forest pests, beside those major forest pests reported here, affect forested Crown land in Alberta. These include major insect pests such as terminal weevils, other defoliators, other bark beetles and the root collar weevil that are known to affect forest trees in the province. Diseases such as the lodgepole pine dwarf mistletoe, rusts, cankers, stem rots and root rots also affect forest trees. However, the details on these pests are reported in this document only if they were monitored in 2006.

[1] In April 2006, the administration units of Sustainable Resource Development were re-named following a re-organization. In this report, the names and boundaries of the new administration units (Appendix I) are used.

The surveys reported in this document were conducted for operational purposes over the forested Crown land and do not cover the entire forested provincial land base. Although every effort is made to ensure that information reported in this document is accurate and complete, its integrity is not guaranteed.[2]

[2] This information is made available for personal use and not intended for commercial use. Written permission must be obtained from the Manager, Forest Health Section prior to using this information in any format in a publication (telephone (780) 427-8474 or facsimile (780) 427-0084).



## Forest Insect Pests

### Conifer Pests

Defoliators

### Spruce Budworm

***Choristoneura fumiferana (Clemens)***

Public Lands

**Forested Crown Land**

The spruce budworm outbreak in Alberta reached a peak in 1995 and collapsed in 2004 in most of the areas (Figure 1). By the time the outbreak collapsed, relatively large-scale tree kill was observed in unsprayed spruce stands that were severely defoliated for eight or more consecutive years. Remnants of this outbreak still persist in northern Alberta.

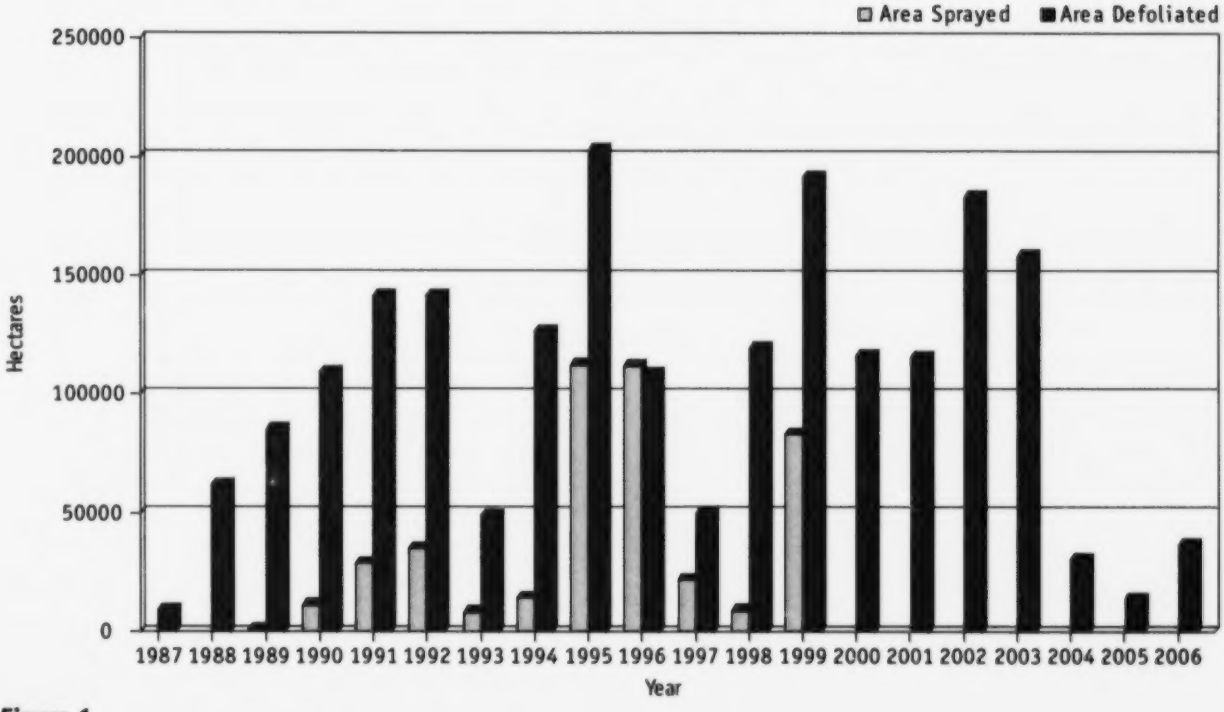



***Figure 1***

Number of hectares annually defoliated by the spruce budworm and hectares annually sprayed to control spruce budworm infestations in Alberta, 1987 – 2006.

The occurrence, extent and severity of spruce budworm defoliation are recorded annually by using fixed wing aircraft to carry out aerial surveys. Defoliation is recorded either digitally by using a map loaded onto a tablet personal computer linked to a global positioning system or manually by using hard copies of 1:250,000 scale maps. The surveyors record severity of spruce budworm defoliation either as moderate (35-70%) or as severe (>70%) (Ranasinghe and Kominek, 1999).

In 2006, spruce budworm defoliated an estimated 36,771 hectares, an increase of 165% compared to the total area defoliated in 2005. This area includes 21,183 hectares of net defoliation and 15,588 hectares of gross defoliation. Defoliation was severe over 3901 hectares and moderate over 17,282 hectares of net area; defoliation was severe over 3220 hectares and moderate over 12,368 hectares of gross area. The changes in extent and severity of spruce budworm defoliation between 2005 and 2006 are illustrated on Figures 2 and 3 respectively, and on Table 1.

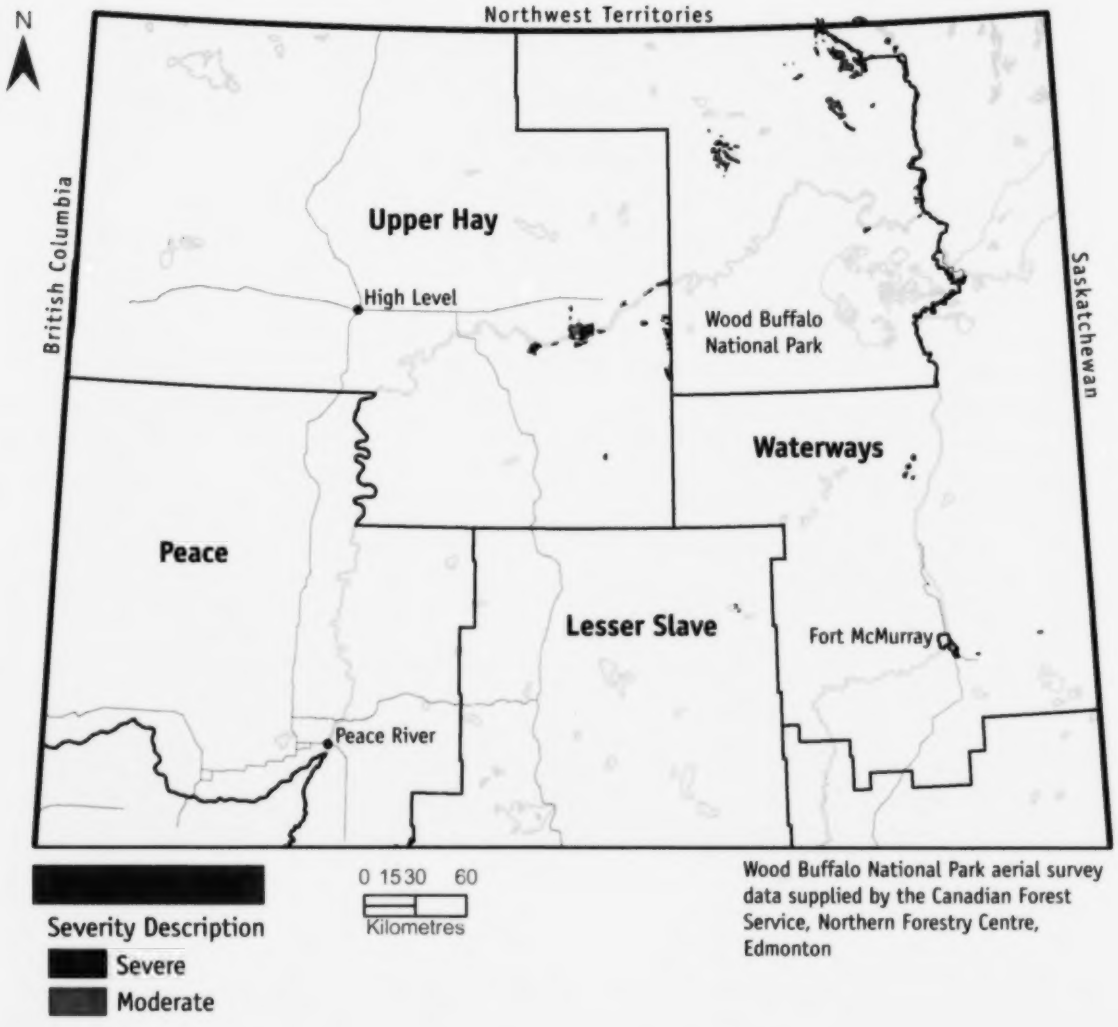



***Figure 2***
Spatial distribution of aerially visible spruce budworm defoliation on forested land surveyed in Alberta in 2005.

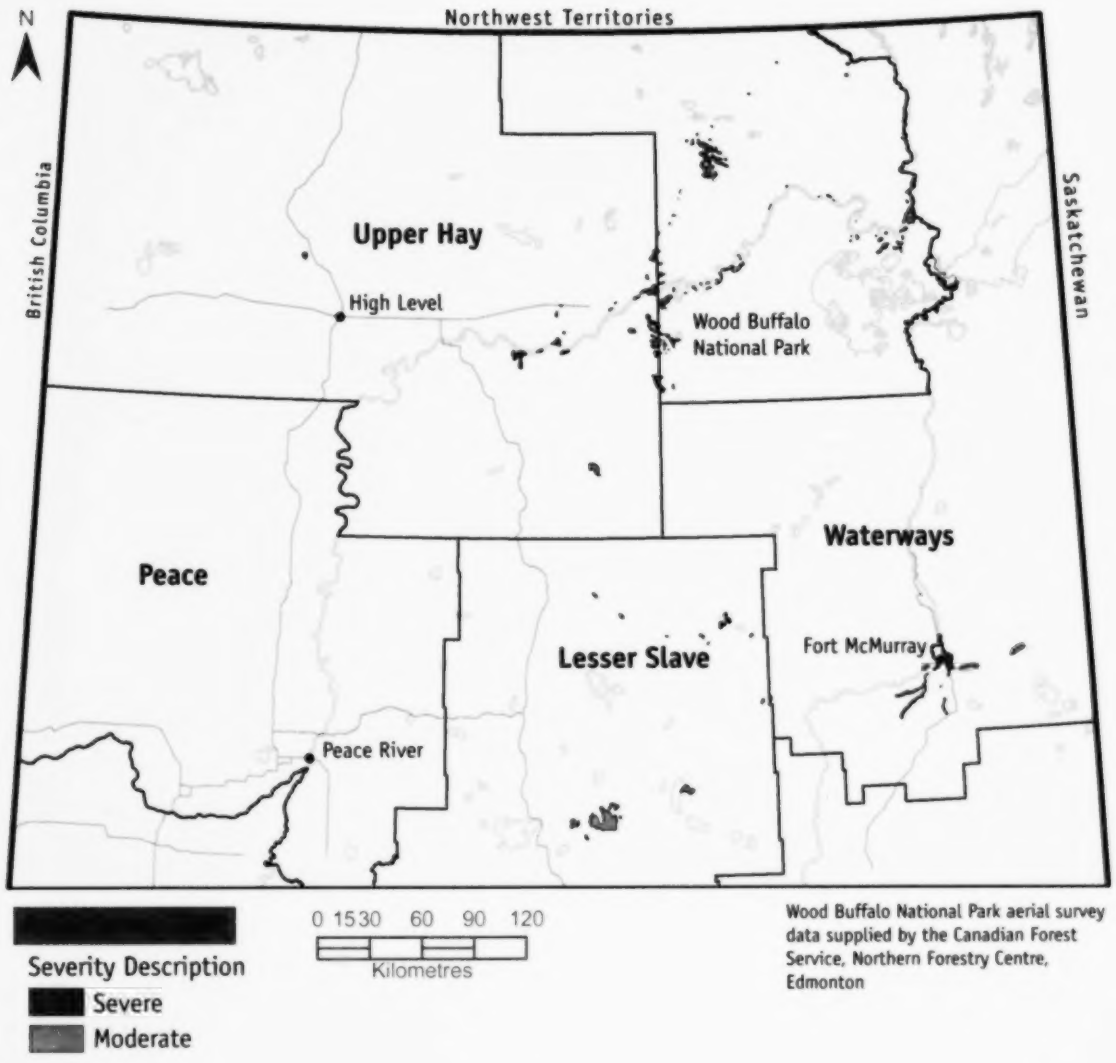



***Figure 3***
Spatial distribution of aerially visible spruce budworm defoliation on forested land surveyed in Alberta in 2006.

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***Figure 2***
Spatial distribution of aerially visible spruce budworm defoliation on forested land surveyed in Alberta in 2005.

***Figure 3***
Spatial distribution of aerially visible spruce budworm defoliation on forested land surveyed in Alberta in 2006.

***Table 1***

The extent (hectares) of spruce budworm defoliation by severity categories in Alberta[a], 2005 vs. 2006

| | 2005 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Moderate | Severe | Total | Moderate | Severe | Total |
| Net[b] | 6636 | 3384 | 10,020 | 17,282 | 3901 | 21,183 |
| Gross[c] | 3495 | 374 | 3869 | 12,368 | 3220 | 15,588 |
| Total | 10,131 | 3758 | 13,889 | 29,650 | 7121 | 36,771 |
| Change[d] | 100% | 100% | 100% | 292% | 189% | 265% |

[a] Extent of defoliation reported from forested Crown land surveyed; national parks excluded
[b] Extent of defoliation reported from inventoried forest land
[c] Extent of defoliation reported from non-inventoried forest land
[d] Comparison of 2005 vs. 2006 total under each severity category

Northeast Alberta

A Forest Health Assistant (Marty Robillard) and a survey contractor (Howard Gates) carried out aerial overview surveys along the major river drainages on July 18th and 19th, 2006. The surveyors used a fixed wing aircraft (Cessna 206). The Forest Health Supervising Technician, Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada (Roger Brett) surveyed budworm defoliation over Wood Buffalo National Park. The combined results of these surveys are shown in Figure 3.

Overall, spruce budworm defoliated area in this region decreased by 8% compared to the area defoliated in 2005 (Table 2).

In the non-inventoried area of this region (north of 58° N latitude) no defoliation was observed compared to 2318 hectares defoliated in 2005. See page 14 for details of budworm defoliation in Wood Buffalo National Park.

In the inventoried area of this region (south of the latitude 58° N), spruce budworm defoliated 5016 hectares in 2006. This is an increase of 217%, compared to the net area defoliated in 2005 (Table 2).

The extent and severity of spruce budworm defoliation during 2003-2006 in areas north of 58° N are shown in Figure 4. Spruce budworm defoliated area north of 58° N drastically declined since 2003; there was no visible budworm defoliation in this area in 2006.

***Table 2***

The extent of spruce budworm defoliation by severity categories in northeastern Alberta, 2005 vs. 2006

| Defoliated Area | Extent of Defoliation (hectares) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | | |
| | Moderate | Severe | Total | Moderate | Severe | Total | Change[c] |
| North of Lat 58° N[a] | 1944 | 374 | 2318 | 0 | 0 | 0 | - |
| South of Lat 58° N[a] | 1551 | 0 | 1551 | 0 | 0 | 0 | - |
| [b] | 1580 | 0 | 1580 | 3974 | 1042 | 5016 | 217% |
| Totals | 5075 | 374 | 5449 | 3974 | 1042 | 5016 | -8% |

[a] gross area (non-inventoried forest land)

[b] net area (inventoried forest land)

[c] percent change of total from 2005 to 2006

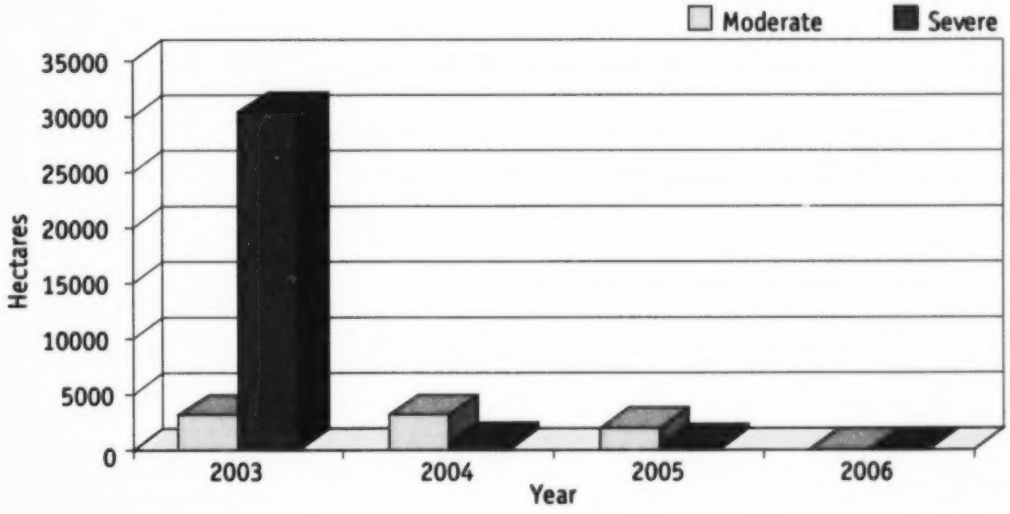



***Figure 4***

Gross number of spruce budworm-defoliated hectares by severity categories in areas north of latitude 58° N in the Waterways Area of Alberta, 2003-2006.

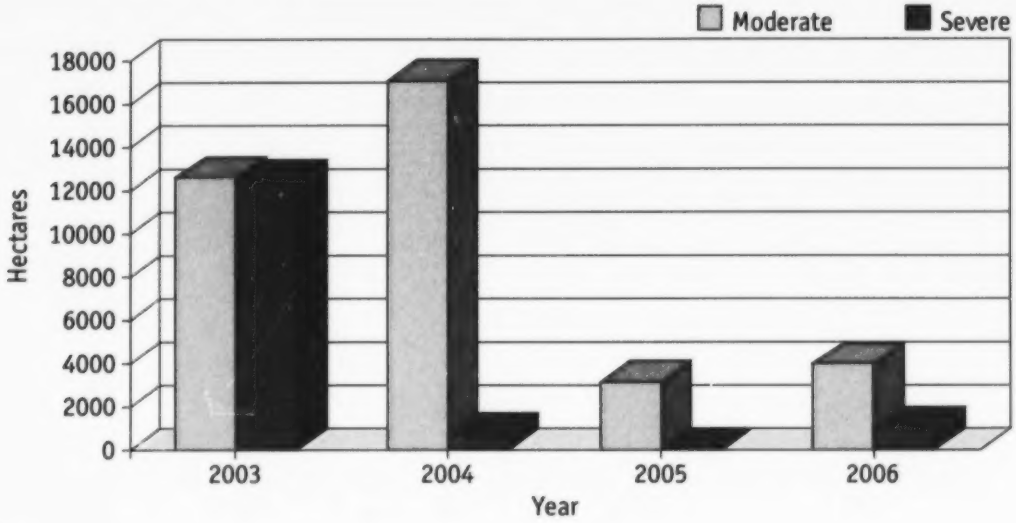



***Figure 5***
Net number of spruce budworm-defoliated hectares by severity categories in areas south of latitude 58° N in northeastern Alberta, 2003-2006.

In contrast, a consistent decline of the extent and severity of defoliation was observed in areas south of latitude 58° N from 2003 until 2005. In 2006, in the non-inventoried area there was no budworm defoliation. In the inventoried area, there was a substantial increase in the area defoliated (Table 2).

Northwest Alberta

The Forest Health Officer, Mike Maximchuk, carried out aerial overview surveys between July 24th and August 16th, 2006 to record the extent and severity of spruce budworm defoliation over the Lesser Slave, Peace and Upper Hay areas. The extent of defoliation was recorded digitally by using maps loaded on to a tablet personal computer linked with a global positioning system (GPS). A fixed-wing aircraft (Cessna 210) was used for this survey.

Figure 3 shows the results of this survey. The spruce budworm defoliated an estimated net area of 16 167 hectares in this region in 2006. This is a 91.6% increase compared to the 8440 hectares defoliated in 2005 (Table 3). In the Lesser Slave Area, an estimated 7824 hectares were defoliated near Chipewyan Lake, Little Buffalo Lake and Brintnell Lake. This is a drastic 28-fold increase compared to the 268 hectares defoliated in this area in 2005. Of this total area 7248 hectares (92.6%) had moderate defoliation and 576 hectares (7.4%) had severe defoliation. No defoliation was observed in the Peace Area. In the Upper Hay Area, 8343 hectares were defoliated. Compared to the 8172 hectares defoliated in 2005 this is only a slight increase (2.1% ). Defoliation in this area was found mainly along the Peace River from the confluence with Wabasca River to the border of Wood Buffalo National Park. Relatively small defoliated areas were found along the Mikkwa River, northeast of Loon River and near the Meander River northwest of High Level. Defoliation was moderate over 6060 hectares (72.6%) and severe over 2283 hectares (27.4%).

*Table 3*
The extent of spruce budworm defoliation by severity categories in northwestern Alberta, 2005 vs. 2006

| Forest Area | Net Defoliation (hectares) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | | |
| | Moderate | Severe | Total | Moderate | Severe | Total | Change[a] |
| Lesser Slave | 268 | 0 | 268 | 7248 | 576 | 7824 | 2819% |
| Upper Hay | 4788 | 3384 | 8172 | 6060 | 2283 | 8343 | 2.1% |
| Total | 5056 | 3384 | 8440 | 13,308 | 2859 | 16,167 | 91.6% |

[a] percent changes of defoliated area totals between 2005 and 2006

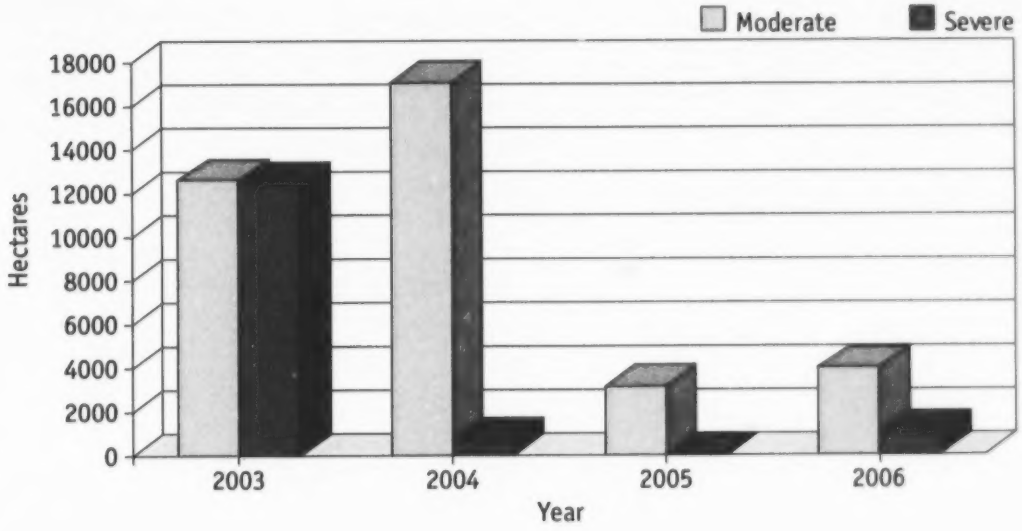



***Figure 6***
Net number of budworm-defoliated hectares by severity categories in northwestern Alberta, 2003-2006.

Figure 6 shows that spruce budworm populations collapsed in this region in 2005. However, in 2006 the defoliated area nearly doubled that of 2005. This is due to a nearly 30-fold increase in the extent of defoliation in the Lesser Slave Area. The extent of defoliation in the Upper Hay Area in 2006 remained about the same as in 2005. The continued use of pheromone-baited traps to monitor moth population levels in "hot spots" of this region is recommended.

Southwest Alberta

There were no reports of spruce budworm defoliation in this region in 2006.

**Provincial Parks and Protected Areas**

Cypress Hills Inter-Provincial Park

Extensive, moderate and severe spruce budworm defoliation was observed in the southwest area of the

park including Elkwater east, Reesor Lake area, Battle Creek and Storm coulee. The extent of this infestation was not estimated. (Weekes, 2006).

**Federal Lands**

Wood Buffalo National Park

On July 26th, 2006 the Supervising Forest Health Technician, Northern Forestry Centre, Canadian Forest Service (Roger Brett) carried out an aerial overview survey of spruce budworm defoliation in Wood Buffalo National Park (WBNP). This survey was carried out under sunny and clear weather conditions in the north and a low cloud ceiling with scattered showers in the south of WBNP. In 2006, the west border area south of the Peace River and the east border area south of the Peace River and Athabasca River confluence were added to the regular survey area. A fixed-wing aircraft (Cessna 206) was used for this survey.

Figure 3 shows the results of this survey. The extent of gross defoliated area within the park (excluding defoliation completely located in the Northwest Territories) was 33,591 hectares. Moderate defoliation was scattered over a gross area of 33,548 hectares while severe defoliation was confined to a small patch of 43 hectares.

The resident spruce budworm population has all but collapsed in the north end of the park, especially along the Sass and Preble creeks, Little Buffalo River, Salt Mountain, Fort Smith and Fort Fitzgerald areas. In this area of the park only a few scattered pockets of defoliation remained, representing a decrease of over 90% in area compared to the area defoliated in 2005. Several large wildfires that occurred in the north end in recent years may have removed host material, thus contributing to the decline of budworm populations.

Moderate defoliation was mapped sporadically along the Athabasca River and was concentrated near the Peace River confluence and over the area between the Peace River and Lake Claire. Moderate defoliation was also concentrated along the Peace River from Big Slough west to the park border, south of the Peace River along the west park border by Ruis Lake and in the Merryweather Lake area where defoliation has been severe in recent years. Only three small pockets of moderate defoliation were observed along the Athabasca River in the southeast corner of the park.

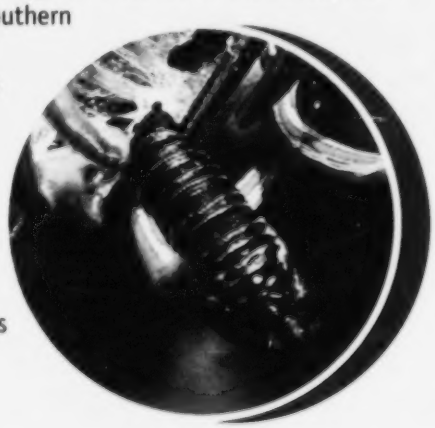
Some new areas with defoliation detected in 2006 may have pre-existed because these areas were not surveyed before. Detection of these areas somewhat subdued a significant decrease in defoliated area in 2006.

**Municipal Lands**

In the past few years, the Municipality of Wood Buffalo has had an ongoing severe spruce budworm infestation in Fort McMurray. However, this defoliation has not been aerially surveyed[3]. In 2006, some areas of the municipality with severe spruce budworm defoliation were sprayed with a formulation of *Bacillus thuringiensis var. kurstaki* (Btk).

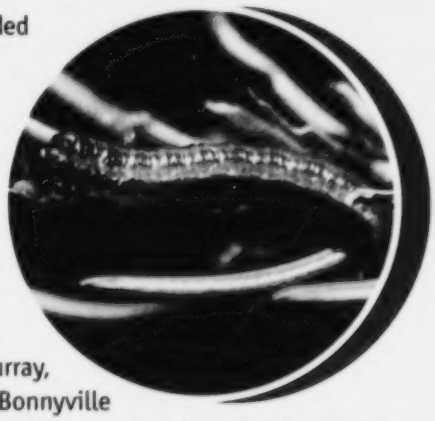
## Western Spruce Budworm
***Choristoneura occidentalis*** (Freeman)

The western spruce budworm caused moderate defoliation of Douglas-fir stands in the Porcupine Hills area of southern Alberta. This defoliation has not been surveyed. In 2006, plots were established to monitor the progress of this infestation.



[3] Stephen Rice, Municipality of Wood Buffalo, personal communication

***Yellowheaded Spruce Sawfly***
***Pikonema alaskensis*** (Rohwer)



The yellowheaded spruce sawfly (YHSS) continued to defoliate young white spruce growing on reclaimed oil and gas lands near Fort McMurray, Cold Lake and Bonnyville in northeastern Alberta. The infestation levels were relatively lower compared to those in 2005 although no insecticides were sprayed to control these infestations.

A perennial yellowheaded spruce sawfly infestation in Cypress Hills Inter-Provincial Park continued to damage some ornamental white spruce at the townsite and near Elkwater Lake.

Yellowheaded spruce sawfly populations continued to infest a large number of white spruce trees throughout the City of Edmonton. In 2006, the pest management operations staff treated about 4400 YHSS-infested trees in the city.

## Bark Beetles

### Mountain Pine Beetle
***Dendroctonus ponderosae*** (Hopkins)

Public Lands

**Provincial Crown Land**

***2005 Surveys[4] Carried Out by Using Pheromone Baits to Detect Mountain Pine Beetle Incidence***

Prior to the mountain pine beetle flight in 2005, ground plots were established to detect presence of beetles in uninfested, high-risk lodgepole pine stands in southwestern Alberta. Three mature lodgepole pines per plot were baited with two-component aggregation pheromone baits (Phero Tech Inc., British Columbia). The results of this survey are shown in Table 4 and Figure 7.

***Table 4***
Mountain pine beetle attacks on pheromone-baited trees in monitoring plots in Alberta, 2005

| Forest Area | No. of plots | | Attacks/ tree | Spill-over Attacks[5] |
|---|---|---|---|---|
| | Total | Attacked | | |
| Smoky | 5 | 3 | 1 - 100 | |
| Southern Rockies | 10 | 7 | 1 - 75 | 0 |
| Clearwater | 6 | 1 | 5 - 18 | 1 |
| Foothills | 14 | 4 | 1 – 218 | 0 |

[4] Refer p. 42 for "Forecast on Major Forest Pests ....." for 2006 survey results

[5] Number of attacked trees located outside of the monitoring plot

*Northwest Alberta*

Five mountain pine beetle pheromone-baited plots were established in the Smoky Area. At three of these plots baited trees were attacked by the mountain pine beetle (Figure 7). Beetle attack was successful in producing progeny in plot 3 (54.7982° N – 119.7061° W). Baited-trees at the other two plots had galleries but no progeny.

*Southwest Alberta*

Southern Rockies and Clearwater Areas

In 2005, seven out of 10 baited-sites in the Southern Rockies Area had mountain pine beetle attacks. Compared to 2004 results, attack levels were moderate (1-75 per tree) in these plots. No spill-over attacks were found. Six sites were baited in the Clearwater Area; one was attacked. Attack levels were relatively low (5-18 attacks per tree) and were similar to those found in 2004. There was one spillover attack at plot 2.

Foothills Area

Four out of fourteen sites with pheromone-baited trees had mountain pine beetle attacks. At one site (plot no. 2) attack levels were high (over 200 attacks on one tree). The other three plots had low to moderate levels of attacks (1 – 130 per tree).

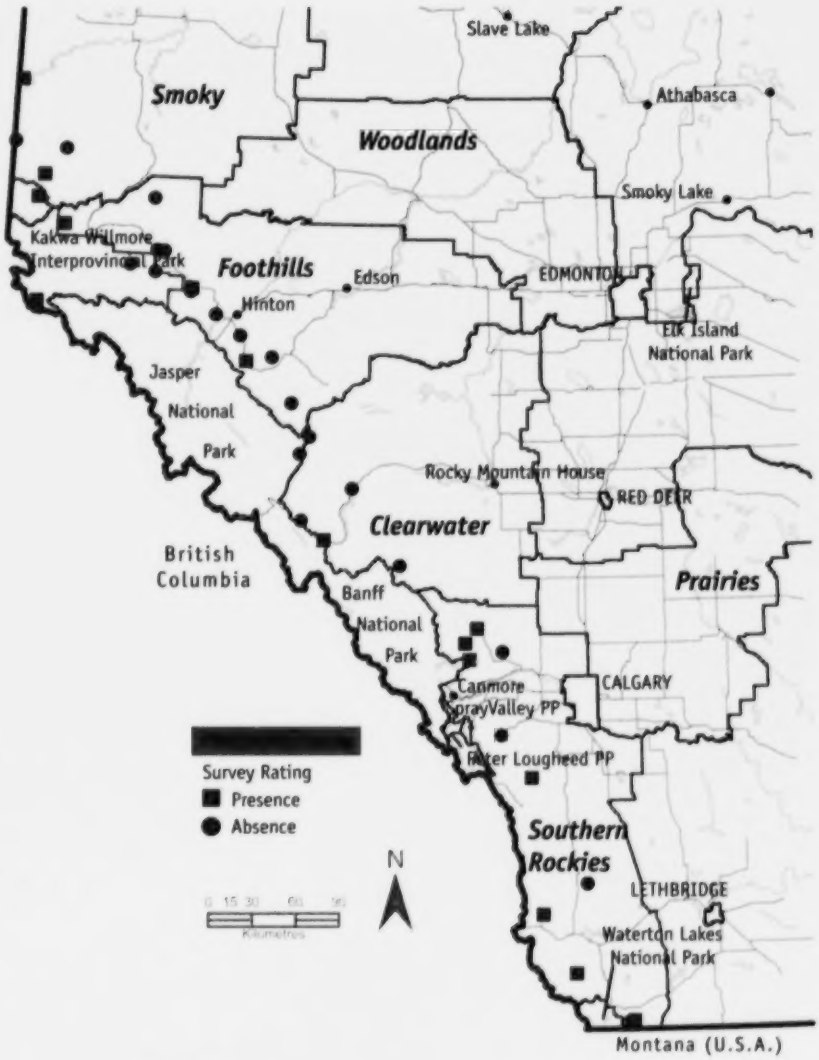



**Figure 7**
Presence/absence of mountain pine beetle hits on pheromone-baited trees in monitoring plots located in Alberta, 2005.

*Cypress Hills Inter-Provincial Park*[6]

Pheromone-baited trees at 15 out of 18 sites had mountain pine beetle hits. These results indicated more widespread beetle activity, the highest since 1986. However, only 29 trees were attacked by beetles at these sites. Most of the attacks were

[6] Based on a report submitted by Les Weekes, Park Forest Officer, Cypress Hills Inter-Provincial Park, Cypress Hills, Alberta

unsuccessful in producing progenies. Most attacks occurred near Graburn, Storm and Nine Mile Creek areas in the south-eastern part of the park. Only nine infested trees were removed; the others had light attacks that were treated at the time of bait collection.

### *2006 Aerial Surveys*[7]

Aerial Overview Surveys are carried out on mature, beetle-prone pine stands based on mountain pine beetle activity on pheromone-baited trees, other known mountain pine beetle activities in the area and existing mountain pine beetle populations. This is a general survey leading to heli-GPS surveys and ground surveys to detect mountain pine beetle-infested trees. These surveys are usually carried out in early to mid-August by using rotary-wing aircraft. Either a digital map loaded onto a tablet personal computer linked with a global positioning system or a hard copy of a map (1:250 000 or finer) is used to record the flight lines, estimated number of faders and their distribution.

**Figure 8**
Locations of suspected mountain pine beetle-killed trees detected during aerial surveys carried out in Alberta in the fall of 2006.

Forest Health Officers and a private contractor carried out 2006 aerial surveys over forested areas with high mountain pine beetle risk. These surveys covered mature pine forest along the eastern slopes of the Rockies extending from Kakwa Wildland Provincial Park Provincial Park in the north to the United States border in the south. Figure 8 illustrates the results of these surveys.

Compared to the results of the 2005 survey (Figure 8a), in 2006 the distribution of suspected mountain pine beetle-caused faders increased significantly in the Smoky Area (Figure 8). In Willmore Wilderness Park, high incidence of faders were observed along

[7] Refer to Section under "Mountain Pine Beetle Management Program" for details of 2006 mountain pine beetle ground surveys on forested Crown land

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[7] Refer to Section under "Mountain Pine Beetle Management Program" for details of 2006 mountain pine beetle ground surveys on forested Crown land

the Upper Sheep Creek, Pauline Creek, Beaverdam Creek and Meadowland Creek. Spotty incidence of faders was observed along Fetherstonhaugh Creek, Muddywater River, Jackpine River, Smoky River and Sheep Creek drainages and along the edges of the areas burned in a wildfire in 2006. In Kakwa Wildland Provincial Park the faders were widespread. In the Weyerhaeuser Forest Management Agreement Area faders were distributed over a wide area extending slightly north of Wapiti River in the north and slightly east of Highway 40 in the east, as depicted in Figure 8.

In southwestern Alberta, the distribution of suspected mountain pine beetle-caused faders in 2006 was higher than in 2005 (Figures 8 and 8a). The Provincial Parks of Bow Valley, Spray Lakes and Peter Lougheeed, as well as areas along the Old Man River and Crowsnest Pass, had faders symptomatic of mountain pine beetle infestations. No faders were detected during aerial overview surveys in the Clearwater Area in 2006.

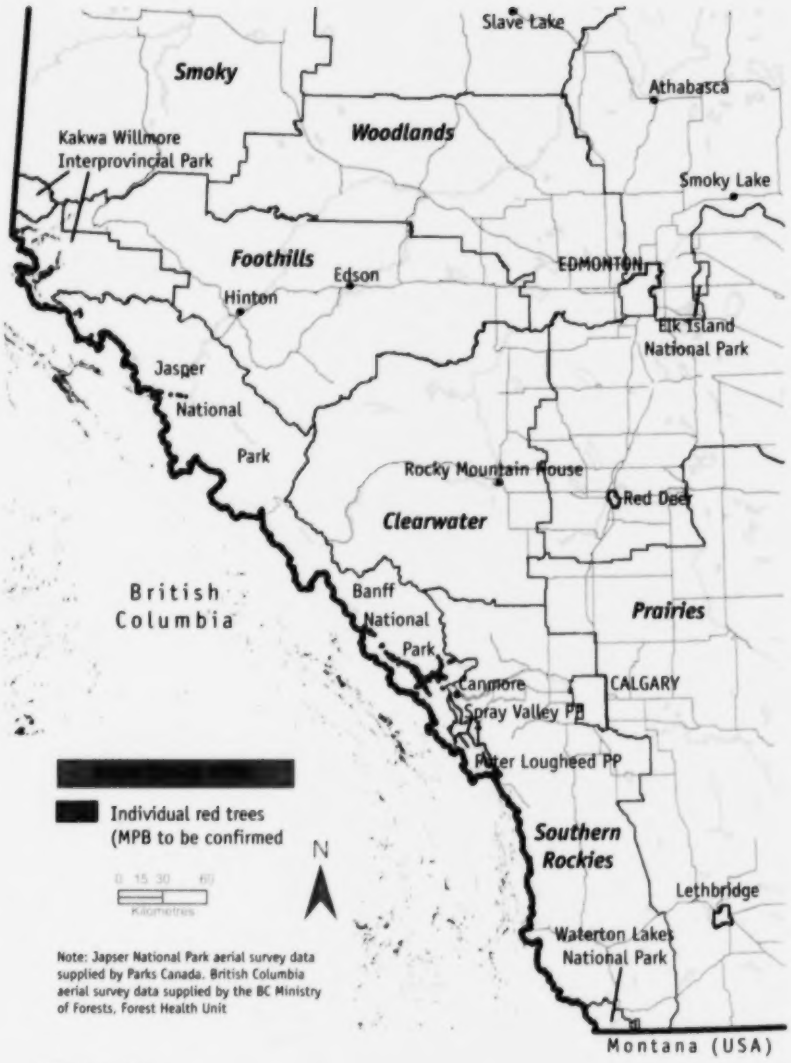


**Figure 8a**
Locations of suspected mountain pine beetle-killed trees detected during aerial surveys carried out in Alberta in the fall of 2005.

### *Ground Surveys*

Refer to Section under "Mountain Pine Beetle Management Program" for details of 2006 mountain pine beetle ground surveys on forested Crown land.

## Broadleaf Pests

### Major Aspen Defoliators

Aerial overview surveys are carried out to estimate the extent and severity of insect pest-caused aspen defoliation over forested Crown land. Fixed wing aircraft are used in these surveys. Either digital maps loaded on to a tablet personal computer linked with a global positioning system or hard copies of 1:250,000 scale maps are used to record the extent and severity of defoliation observed during these surveys. The surveyors categorize aspen defoliation as light (<35%), moderate (35-70%) or severe (>70%). The results of these surveys are shown in Figure 9. Table 6 compares the extent of aspen defoliation in 2005 and 2006.

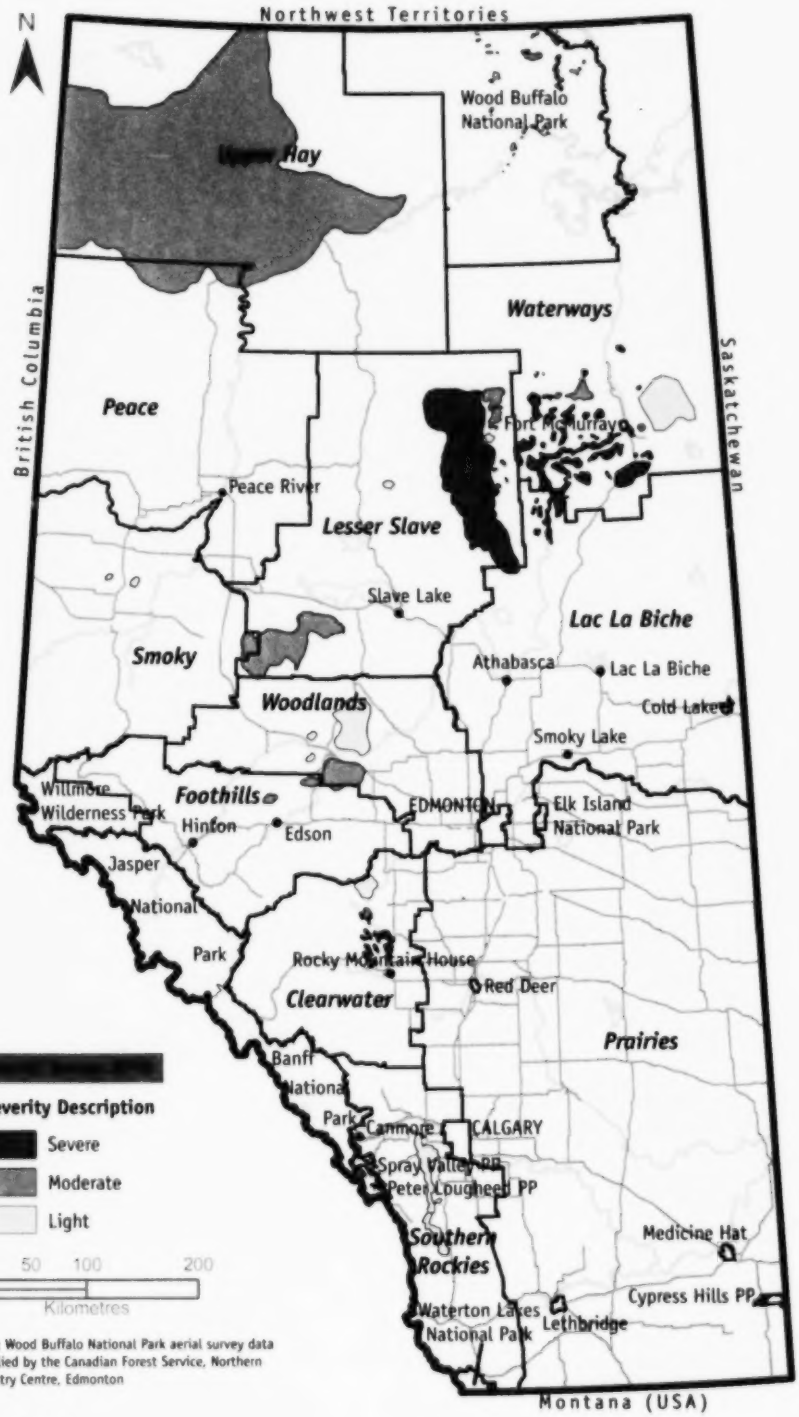


**Figure 9**
Spatial distribution of aerially visible insect pest-caused aspen defoliation surveyed in Alberta, 2006.

## Broadleaf Pests

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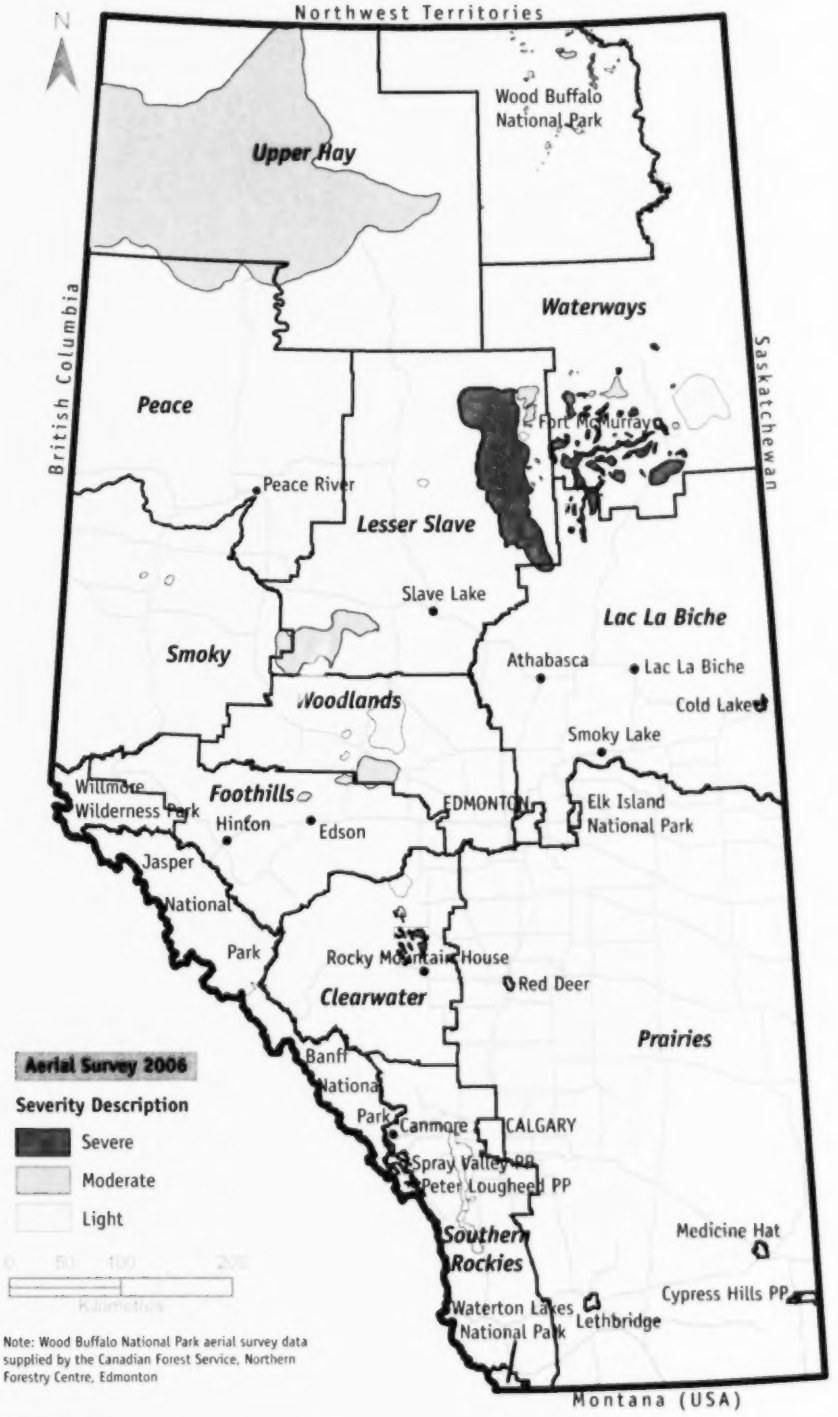



**Figure 9**
Spatial distribution of aerially visible insect pest-caused aspen defoliation surveyed in Alberta, 2006.

**Table 5**
The extent (hectares) of forest insect pest-caused aspen defoliation by severity categories in Alberta[a], 2005 vs. 2006

| Region | Gross area of defoliation (ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | |
| | Light | Moderate | Severe | Light | Moderate | Severe |
| Northeast | 2753 | 5035 | 40,173 | 161,508 | 28,859 | 279,555 |
| Northwest | 379,271 | 287,944 | 2,061,360 | 18,027 | 4,329,260 | 631,992 |
| Southwest | 16,347 | 7442 | 18,062 | 258,924 | 108,943 | 34,088 |
| **Total** | | **2,818,387** | | | **5,851,155** | |

[a] National and provincial parks excluded

In 2006, the total gross area in forested Crown land with aspen defoliation was over 5.8 million hectares (Table 6). This is a 107% increase from the area with gross defoliation in 2005. The forest tent caterpillar (*Malacosoma disstria* Hubner) was the predominant defoliator of aspen in 2006. Defoliation primarily caused by the tent caterpillar was scattered over 5,193,325 hectares, accounting for 88.8% of all aspen defoliation in the surveyed area. Compared to 2005, the large aspen tortrix (*C. conflictana* (Walker) populations further declined in 2006, limiting their defoliation to 401,011 hectares (6.9%). The aspen leafroller (*Pseudecenterra oregonana* (Walsingham), was a major defoliator in 2006 with its defoliation occurring over 256,818 hectares (4.3%).

## Northeast Alberta

The Forest Health Officer (Tom Hutchison) and a Survey Contractor (Howard Gates) carried out aerial overview surveys on July 11–14, 2006 out of Fort McMurray; Forest Health Technicians (Marty Robillard and Rudy Markgraf ) carried out an aerial overview survey on July 20, 2006 out of Athabasca. A fixed wing aircraft (Cessna 206) was used for these surveys.

The results of these surveys are shown in Figure 9. Compared to 2005, there was a dramatic, nearly 10-fold increase in area with aspen defoliation in this region in 2006 (Table 6). The forest tent caterpillar damage accounted for all the defoliated area observed during the aerial surveys. However, during ground truthing minor defoliation by aspen leafroller and aspen twoleaf tier (*Enargia decolor* (Walker) was observed at several locations. One small patch of aspen defoliation near Amadou Lake was attributed to the large aspen tortrix.

The changes in the extent and severity of aspen defoliation in this region from 2003-2006 are shown in Figure 10. This figure illustrates the collapse of defoliation in 2004, which coincided with the decline of large aspen tortrix populations. The increase in aspen defoliation in 2005 in this region was attributed to the rise of forest tent caterpillar populations.

**Table 6**
The extent of forest insect-pest caused aspen defoliation by severity categories in northeastern Alberta, 2005 vs. 2006

| Area | Gross area of defoliation (ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | |
| | Light | Moderate | Severe | Light | Moderate | Severe |
| Lac La Biche | 2299 | 0 | 4954 | 0 | 913 | 46,549 |
| Waterways | 454 | 5035 | 35,219 | 161,508 | 27,946 | 233,066 |
| Total | 2753 | 5035 | 40,173 | 161,508 | 28,859 | 279,555 |
| **Total** | | **47,961** | | | **469,922** | |

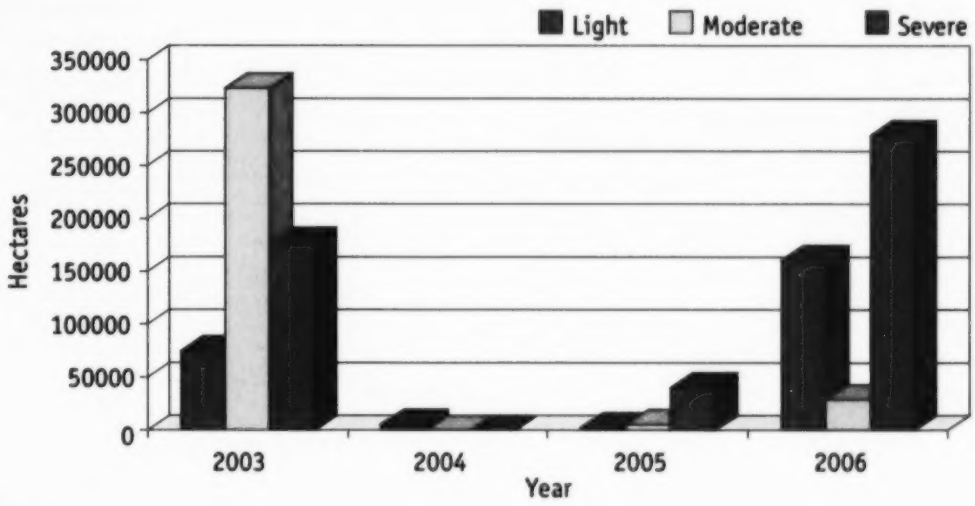



**Figure 10**
Comparison of the gross number of insect pest-defoliated hectares of aspen by severity categories in northeastern Alberta, 2003-2006.

## Northwest Alberta

Between June 19th to July 14th, 2006 the Forest Health Officer used a Cessna 210 fixed-wing aircraft to carry out aerial overview surveys to digitally map aspen defoliation in this region. Digital maps of the survey areas loaded onto a tablet personal computer linked with a global positioning system unit were used for these surveys. The results of these surveys are shown in Figure 9.

Insect pest-caused aspen defoliation was scattered over an estimated 4,979,279 hectares in this region. Most (86.9%) of this defoliation was of moderate intensity; 12.7% was severe and 0.4% was light. The forest tent caterpillar was the predominant aspen defoliator in this region in 2006. The forest tent caterpillar-caused defoliation was spread over an estimated 4,723,403 hectares. Most (86.4%) of this defoliation was moderate; 13.4% was severe and 0.2% was light. Forest tent caterpillar defoliation was found in Lesser Slave, Peace and Upper Hay areas. The aspen leafroller was the other noticeable defoliator in this region in 2006. The aspen leafroller defoliation was scattered over 255,876 hectares in Lesser Slave and Smoky areas. Nearly all (97%) of this defoliation was moderate and the remaining 3% was light. The extent and severity of 2005 vs. 2006 aspen defoliation in this region are shown in Table 7.

Compared to 2005, the gross area of aspen defoliation increased by 82% in 2006. Most of this increase was in moderately defoliated area; the extents of light defoliation as well as of severe defoliation decreased in 2006.

In this region, the Upper Hay Area had the largest aspen defoliation extending over 3,849,553 hectares; this is about double the extent of defoliation in 2005. This forest tent caterpillar-caused defoliation mainly extended from the British Columbia border in the west to the Caribou Mountains in the east, along the Chinchaga River in the south and along the Steen River in the north. Most of this defoliation was moderate (Table 7). In the Lesser Slave Area, the tent caterpillar-defoliated gross area increased from 505,382 hectares in 2005 to 683, 900 hectares in 2006 making it the dominant defoliator; defoliation was severe from Wabasca in the south to Chipweyan Lake in the north and from Teepee Lake in the west

**Table 7**
The extent of forest insect-pest caused aspen defoliation by severity categories in northwestern Alberta, 2005 vs. 2006

| Forest Area | Gross area of defoliation (ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2005 | | | 2006 | | |
| | Light | Moderate | Severe | Light | Moderate | Severe |
| Lesser Slave | 3405 | 5108 | 500,274 | 10,271 | 261,034 | 631,992 |
| Smoky | 223,596 | 0 | 0 | 7757 | 28,723 | 0 |
| Peace | 20,919 | 60,557 | 0 | 0 | 189,950 | 0 |
| Upper Hay | 131,351 | 222,279 | 1,561,086 | 0 | 3,849,553 | 0 |
| Total | 379,271 | 286,944 | 2,061,360 | 18,027 | 4,329,260 | 631,992 |

to Little Buffalo Lake in the east. The aspen leafroller defoliation was found over an area of 219,397 hectares. This defoliation was recorded over a relatively large area south of Lesser Slave Lake and two small areas north of Grande Prairie; numerous small pockets of defoliation found south of Grande Prairie were not recorded because of their small size and light defoliation. The large aspen tortrix population in this area collapsed in 2006. In the Smoky Area, the aspen leafroller defoliation was scattered over an estimated 36,479 hectares; most (79%) of this defoliation was moderate and 21% was light. In this area, the large aspen tortrix defoliation was scattered over 223,596 hectares in 2005 but this population collapsed in 2006. In the Peace Area, the forest tent caterpillar defoliation increased 133% from 2005 to 2006 to reach 189,950 hectares; all of this defoliation was moderate.

The extent of 2002-2006 aspen defoliation by severity categories in Northwestern Alberta is shown in Figure 11.

This figure shows a rise of aspen defoliation in 2002-2003. This defoliation was caused by the large aspen tortrix. It collapsed in 2004 and in 2005 it was replaced by forest tent caterpillar defoliation that expanded exponentially in 2006.

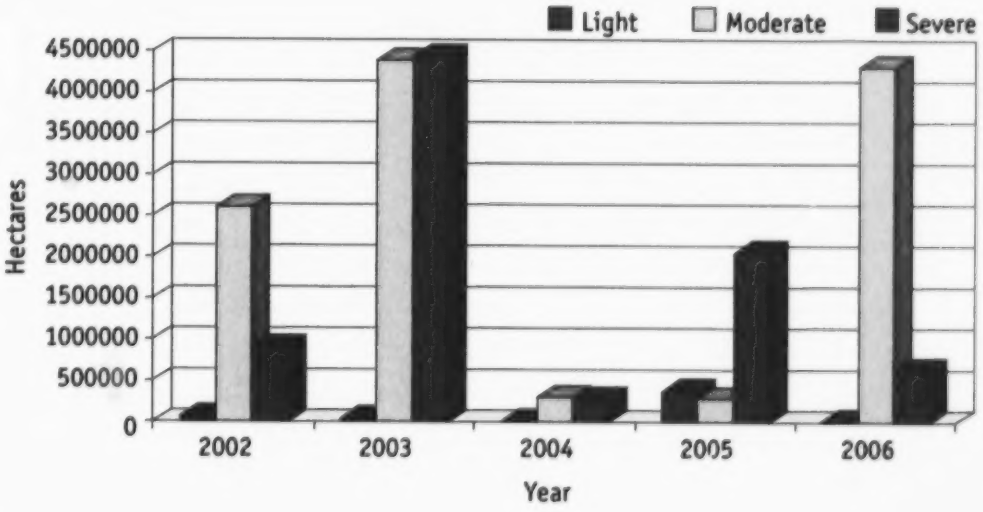



***Figure 11***
Comparison of the gross number of insect pest-defoliated hectares of aspen by severity categories in northwestern Alberta, 2002-2006.

## Southwest Alberta

Aspen defoliation, almost all caused by the large aspen tortrix, was scattered over an estimated 401,953 hectares throughout this region (Figure 9). This is a dramatic increase compared to 41,851 hectares of aspen defoliation that occurred in this region in 2005. This included 942 hectares defoliated by the aspen leaf roller.

In Southern Rockies and Clearwater areas, the Forest Health Technicians (Bart McAnally and Rupert Hewison) together with a contractor carried out the aerial overview surveys. A Navajo fixed-wing aircraft was used for the surveys carried out on June 26-27, 2006. They used digital maps loaded onto a tablet personal computer linked to a global positioning system to record survey data. In the Southern Rockies Area moderate defoliation caused by the large aspen tortrix was scattered over an estimated 90,043 hectares. In the Clearwater Area the large aspen tortrix defoliation was recorded over an estimated 73,229 hectares. Defoliation was light over 32,950 hectares (45%), moderate over 6191 hectares (8%) and severe over 34,088 hectares (47%).

In Foothills and Woodlands areas, the Forest Health Technician together with a contractor used a fixed-wing aircraft to survey aspen defoliation during the first week of July, 2006. Digital maps loaded onto a tablet personal computer that is linked to a global positioning system were used to record the extent and severity of defoliation. In this area, large aspen tortrix defoliation occurred over an estimated 28,621 hectares. Defoliation was light over 3006 hectares (11%) and moderate over 25,615 hectares (89%). In the Woodlands Area large aspen tortrix defoliation occurred over an estimated 209,117 hectares. This defoliation was light over 132,923 hectares (64%) and moderate over 76,194 hectares (36%). In addition, the aspen leaf roller possibly defoliated another 942 hectares in this area.

Figure 12 shows build up and decline of large aspen tortrix populations that collapsed in 2004. Although some forest tent caterpillar activity was observed, the anticipated outbreak did not materialize in 2006 in this region. Instead it appears that the large aspen tortrix populations increased in southwest Alberta.

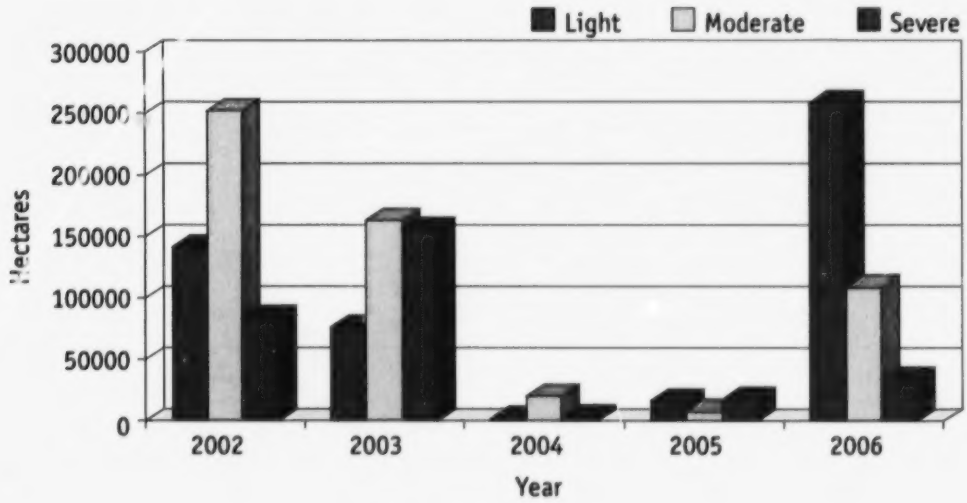



***Figure 12***
Comparison of the gross number of insect pest-defoliated hectares of aspen by severity categories in southwestern Alberta, 2002-2006.

### Wood Buffalo National Park

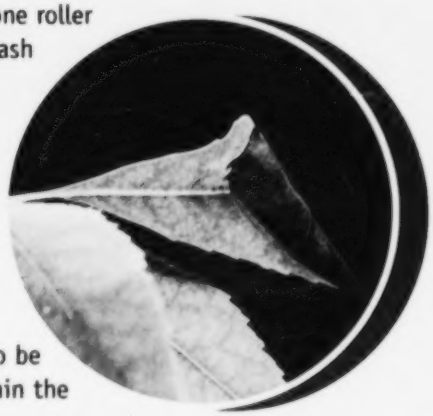
On July 26th, 2006 the Supervising Forest Health Technician, Northern Forestry Centre, Canadian Forest Service (Roger Brett) carried out an aerial overview survey to map aspen defoliation on Wood Buffalo National Park. Although aspen defoliation was mapped throughout the park, it was most readily observed along Highway 5 and Peace Point Road (Figure 9). Large areas of aspen defoliation were mapped along the Peace River west of Peace Point. Aspen defoliation observed was attributed mostly to a complex of the large aspen tortrix and the aspen serpentine leafminer (*Phyllocnistis populiella* Chambers). However, aspen defoliation along the Peace River and in the area south of the Peace River by the west border may have been caused by the forest tent caterpillar. Although constraints on accessibility and time availability prevented ground truthing at all locations, the aspen serpentine leafminer was observed on the ground along Highway 5 at the north end of the park.

## Minor Insect Pests

### Willow Leafminer
***Micrurapteryx salicifoliella*** (Chambers)

Extensive areas of willow with willow leafminer damage were observed in northeastern Alberta. Willow dieback was evident in the areas north of Wandering River and in the Waterways Area.

### Ash Leaf Cone Roller
***Caloptilia fraxinella*** (Ely)



The ash leaf cone roller infested some ash trees around Athabasca, Wandering River and Fort McMurray in Northeast Alberta. The range of this pest appears to be increasing within the region.

### Aspen Two-leaf Tier
***Enargia decolor*** (Walker)

Some aspen two-leaf tier damage was reported from the Woodlands Area but this was not surveyed in detail. Aspen two-leaf tier moths were found in forest tent caterpillar pheromone-baited traps deployed in northeastern Alberta.

# Diseases and Disorders

## Diseases

Many diseases affect forest trees in Alberta. Needle casts and rusts, dwarf mistletoe, stem cankers and rusts, stem and root decay caused by fungi, cone rusts, seedling diseases, leaf rusts and blights are among the common diseases of forest trees. This report contains details on those diseases that were monitored in 2006.

### Spruce Needle Rust
(*Chrysomyxa* sp.)

In southwestern Alberta, a heavy infection caused by spruce needle rust was observed in early summer in the western section of Foothills Area and south of Hinton in southwestern Alberta. White spruce in Switzer Provincial Park and further east were hit hard by this infection.

## Disorders

### Snow Damage

Snow storms in the fall caused substantial damage to ornamental hybrid poplars in Elkwater in the Cypress Hills Interprovincial Park. These storms also damaged aspen, lodgepole pine and white spruce found along the north-facing edges of many forest stands of the park.

## Urban Forest Pests[8]

### Insect Pests

Conifer Pests
**Foliage Pests**

**Yellowheaded spruce sawfly**
(***Pikonema alaskensis*** (Rohwer)

The yellowheaded spruce sawfly (YHSS) populations continued to increase in 2006 and defoliated a large number of white spruce throughout the City of Edmonton. In 2006, the pest management operations staff sprayed approximately 4400 YHSS-infested trees in the City of Edmonton. In addition, Orthene® was injected into 329 infested trees to control this pest problem.

**Spruce Spider Mite**
(***Oligonychus ununguis*** (Jacobi)

Many white spruce in Edmonton were infested by the spruce spider mite. Even some spruce trees infested by the yellowheaded spruce sawfly were attacked by these mites.

Broadleaf Trees
**Defoliators**

Numbers of the satin moth, *Leucoma salicis* (L.) appeared to have leveled off in 2006. An increase in the parasitoid wasp, *Cotesia* sp., has kept the satin moth population at bay. Populations of the apple maggot, *Rhagoletis pomonella* (Walsh) appear to be spreading in the Edmonton area but this is still considered to be a minor pest causing cosmetic damage. No gypsy moths, *Lymantria dispar* (L.), were caught in pheromone-baited traps set up at various strategic locations around the city, in conjunction with the Canadian Food Inspection Agency (CFIA). Bruce spanworm (*Operophtera bruceata* (Hulst) populations increased in the outskirts of the city. Few forest tent caterpillar larvae were found in the city but these did not cause noticeable defoliation. Defoliation on Manitoba maples by the larger boxelder leafroller, *Archips negundana* (Dyar), expanded along the river valley. Several hundred maples were severely defoliated but re-foliated within weeks of peak defoliation. The populations of the forest tent caterpillar, fall cankerworm (*Alsophila pometaria* (Harr.), and amber-marked birch leafminer (*Profenusa thompsoni* (Konow) also increased slightly. In addition, another species of birch leafminer (*Scolloneura vicina*) has been reported in the Edmonton area by the Canadian Forest Service. Signs of parasitism have already been observed on this leafminer. The spiny ash sawfly, *Euparophora parka* (Cress.), increased in numbers compared to those in 2005. This pest was invariably found on ash trees infested by the ash plant bug (*Tropidosteptes* sp.) and the ash leaf cone roller (*Caloptilia fraxinella* (Ely). The ash leaf cone roller was widespread in the city. Nearly all the leaves on some ash trees were affected by this pest. An unidentified *Apanteles* sp. parasitized from 20% to 90% of this caterpillar larvae in various neighbourhoods. The oblique banded leafroller, (*C. rosaceana* (Harr.) occurred in high numbers on ash trees at a few locations. Several boulevard trees in downtown Edmonton had significant defoliation and leafroller larvae dangling on silk threads caused some public concern.

[8] Based on an unpublished report by M. Jenkins and M. Wartenbe of the City of Edmonton

### Sucking Insects

The European elm scale, *Gossyparia spuria* (Mod.), has become established in the city, especially on young elms. The oyster scale (*Lepidosaaphes* sp.) populations crashed in 2006. The ash plant bug (*Tropidosteptes amoneus* (Reuter) populations exploded in 2006 causing considerable damage including leaf drop on a large number of ash trees. This infestation further stressed out ash trees making them more prone to other pests. The populations of the cottony psyllid, *Psyllopsis discrepans*, made a major comeback attacking almost every black ash in the city. Over 2000 black ash were injected with either Confidor® (Imidacloprid) or Orthene® (Acephate) to control this pest and other pests attacking ash trees. The lace bugs were found on Saskatoon and Mayday but caused minimum damage. The European fruit lecanium (*Parthenolecanium corni* Bouché) numbers rose in the city. These scales attack ash trees distressed due to other pest attacks. Few ash trees were infested with wooly ash aphid and ash leafcurl aphids (*Prociphilus fraxinifolli*). The clumped pseudo-galls of these insects have considerable amount of honeydew making them a potential nuisance species. Trounce® (a mix of insecticidal soap and pyrethrins) was ineffective in controlling these pests within galls.

### Bark Beetles and Weevils

In Edmonton, five smaller European elm bark beetles (*Scolytus multistriatus*, (Marsh.) were captured at 5 out of 84 sites with panel and funnel traps. Though higher compared to the single beetle trapped in 2005 this still is a low beetle catch. The western ash bark beetle, *Hylesinus californicus* (Swaine), continued to be active on dead branches of ash trees. The beetle-killed ash trees have been chipped and used as mulch. Experiments have shown that at least 95% of these beetles in chipped ash bolts are killed, making ash chips safe for mulching. The pine engraver, *Ips pini* (Say), and other native bark beetles were found in several dead pine trees in the city; however, there were no mountain pine beetles in these dead pines.

### Diseases and Disorders

Forty-seven new cases of the fungal wilt disease, *Dothiorella ulmi*, were confirmed in Edmonton in 2006[9]; many of these trees were too dry to be sampled and cultured to confirm disease incidence. Twelve diseased large elms with over 50% decline of the living canopy were slated for removal in 2006.

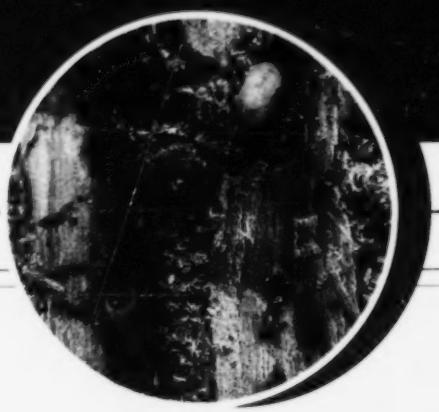
In spite of a relatively wet year, the soil moisture deficit continued and the city lost more trees due to drought conditions that prevailed in the previous years. Ash trees in particular were hit hard in 2006. To date the city has lost a few thousand trees due to drought.

### Dutch Elm Disease[10]

Alberta still remains free of Dutch elm disease in spite of continued capturing of its vectors (smaller European elm bark beetle) in traps set up at many locations in the province.

[9] Confirmed by Dr. J.P. Tewari, University of Alberta

[10] Based on an unpublished report by Janet Feddes-Calpas of STOPDED Society



## Mountain Pine Beetle Management Program

The mountain pine beetle infestations in the province were managed under a comprehensive program that was undertaken in 2005/06. This program included education and awareness, prevention, monitoring, surveying, assessment and control operations. These operations aimed at controlling the current mountain pine beetle populations and reducing the risk of future infestations.

### Education and Awareness

Southern Rockies and Clearwater Areas

Christie Ward, Forest Health Officer, made several presentations to wide ranging organizations that included forest industry, municipalities, Rotary Clubs, Environmental Groups, wildland firefighters and Woodlot Association. She organized tours and provided updates to local media, and staffed information booths at trade shows.

### Prevention

Under the Forest Management Directive 2006-06 that came into effect on November 28, 2006 prior ministerial approval is needed to import conifer logs or other forest products with attached bark into the province. This directive supersedes previous ministerial order issued on March 24, 2005 under the authority of Alberta Forests Act, RSA 2000 c. F-22 prohibiting transportation of pine logs or pine products with bark attached, within Alberta.

Southern Rockies and Clearwater Areas

The Forest Health Officer organized two local mountain pine beetle control task groups to discuss beetle spread and control. The Crowsnest Task Group was composed of representatives from Sustainable Resource Development, British Columbia Ministry of Forests, Forest Industry, Municipalities and Alberta Tourism, Parks, Recreation and Culture. The Bow Valley Task Group had representatives from Banff National Park, Alberta Tourism, Parks, Recreation and Culture, Sustainable Resource Development, Canmore Town, and private developers. These groups discussed mountain pine beetle spread and control strategies on adjacent land bases.

### Assessment and Control Operations (Beetle-Focused Strategy)

Public Lands

**Provincial Crown Land**

Northwest Alberta

**Smoky Area (NW1)**

***Ground Surveys***

During regular ground surveys carried out between October 18-26, 2005, crews surveyed 165 sites and detected 284 attacked trees at 126 sites. Most of these trees were found in Kakwa Wildland Provincial Park and 16 trees were found on Weyerhaeuser Forest Management Area; the green to red ratio was 0.84. Another 17 beetle-attacked trees were detected during control operations (Table 8). In addition, the crews detected 51 trees with lodgepole pine beetle; 9 trees with Ips beetle; 33 trees with other damage agents and 10 trees with pitched out mountain pine beetle.

***Table 8***
Results of the ground surveys to detect mountain pine beetle-attacked trees on forested provincial Crown land in Alberta, September 2005 to August 2006

| Location | Type of Land | No. of Attacked Trees Detected[a] | |
|---|---|---|---|
| | | During Ground Survey | During Control |
| **SW1** | | | |
| Bow Valley | Crown Land | 336 | 2 |
| Old Man River | Crown Land | 101 | 1 |
| Crowsnest/Castle | Crown Land | 1116 | 82 |
| Spray Lakes | Crown Land | 868 | 3 |
| Peter Lougheed | Provincial Park | 17 | 0 |
| **SW3** | | | |
| Willmore Wilderness | Provincial Park | 10,722 | 307 |
| **NW1** | | | |
| Kakwa Wildland | Provincial Park | 284 | 17 |
| Total | | 13,444 | 412 |

SW 1 = Southern Rockies; SW2 = Clearwater; SW3 = Foothills; NW1 = Smoky
[a] No. includes both red and green trees detected

Cut and Burn Infested Trees

The control crews cut and burned 295 infested trees in the Smoky Area.

Southwest Alberta

**Southern Rockies and Clearwater Areas**

2005/06 Ground Surveys

Ground surveys were based on the results of aerial overview surveys. Four contractors carried out transect and concentric surveys to detect currently infested trees.

On provincial Crown land attacked trees were found in Bow Valley, Old Man River drainage, Crowsnest/Castle and Spray Lakes areas (Table 8).

Spray Lakes: Between November 1, 2005 to January 31, 2006 an average of six surveyors carried out transect surveys over two transect areas covering 1600 hectares at the south end of the Spray Lakes Reservoir. They detected 638 trees with current attack and 230 trees with old attacks. Another three attacked trees were detected during the control operations.

Bow Valley: Between January 21 to February 28, 2006, six contracted surveyors carried out seven transect surveys covering 1200 hectares in Bow Valley. Upon detection of additional red trees, concentric surveys were carried out over Skogan's Pass at the east end of the Bow Valley Provincial Park. The survey crews detected 225 current attacks and 111 old attacks. Another two attacked trees were detected during the control operations.

Oldman River: Between January 3-14, 2006 a two-person contract crew detected 101 attacked trees. Another attacked tree was detected during the control operations.

Peter Lougheed Park: Seventeen attacked trees were detected in Peter Lougheed Provincial Park.

In Southern Rockies Area, altogether 1405 sites were surveyed; 2438 mountain pine beetle-infested trees were detected at 1379 sites during regular surveys; another 88 trees were detected during control operations for a total of 2526 attacked trees (Table 8).

**Foothills Area**

2005/06 Ground Surveys

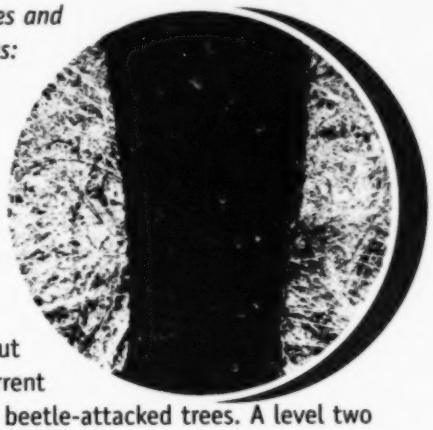
Seasonal crews made up of Sustainable Resource Development staff and contractors ground surveyed Willmore Wilderness Park and the Forest Management Units E8 and E10 from October 17, 2005 to June 15, 2006. At its peak 21 persons were involved in these surveys. These crews transect-surveyed drainages on the north side of Upper Sheep Creek, Pauline Creek, Beaverdam Creek and Meadowland Creek where attack incidence was high. The crews concentric-surveyed other areas of Sheep Creek drainage and drainages of Jackpine River, Smoky River and Fetherstonhaugh/ Muddywater River that had spotty attacks.

These crews surveyed 2667 sites and detected 10,722 mountain pine beetle-attacked trees during regular ground surveys. Another 307 attacked trees were detected during beetle control operations bringing the total number of trees attacked to 11,029 (Table 8).

Cut and Burn Infested Trees

The number of beetle-attacked trees that were controlled during the control operations is shown in Table 9. Under the control program, 12,938 mountain pine beetle-infested trees were treated at 4172 sites between September 2005 and August 2006. The details of this program are given below.

*Southern Rockies and Clearwater Areas:*



Between January 15–March 30, 2006, employees of Sustainable Resource Development cut and burned current mountain pine beetle-attacked trees. A level two Incident Command Team organized the cut and burn control action carried out by about 30 personnel and audited the control action. Altogether 2109 infested trees were treated in this area (Table 9).

*Foothills Area*

In Willmore Wilderness Park, 10,534 infested trees were treated during control operations.

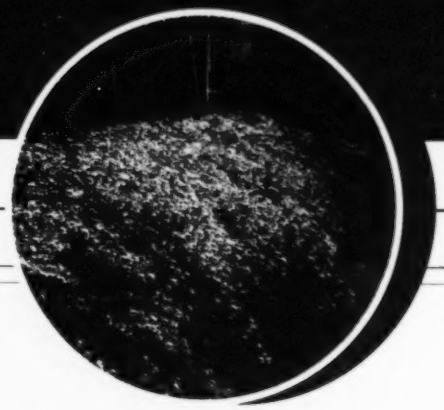
***Table 9***

The number of mountain pine beetle -attacked trees cut and burned during control operations on forested provincial Crown land in Alberta, September 2005 to August 2006

| Location | Type of Land | Number of Sites | Number of Trees Controlled |
|---|---|---|---|
| SW1-2 | | | |
| Bow Valley | Crown Land | 247 | 242 |
| Old Man River | Crown Land | 48 | 92 |
| Crowsnest/Castle | Crown Land | 597 | 1117 |
| Spray Lakes | Crown Land | 470 | 642 |
| Peter Lougheed | Provincial Park | 17 | 16 |
| SW3 | | | |
| Willmore Wilderness | Provincial Park | 2667 | 10,534 |
| NW1 | | | |
| Kakwa Wildland | Provincial Park | 126 | 295 |
| Total | | 4,172 | 12,938 |

SW 1 = Southern Rockies; SW2 = Clearwater; SW3 = Foothills; NW1 = Smoky

# Forest Invasive Alien Plants



Invasive plants are characteristically adaptable and aggressive with high reproductive capacity. Their vigour combined with lack of natural enemies often lead to outbreak populations. Invasive plants have the ability to out-compete native and other desired vegetation. These plants can reduce forage production, impede the successful reclamation of disturbed sites, delay forest succession, reduce plant species richness and alter wildlife habitat.

Sustainable Resource Development's goal is to minimize social, economic, and environmental threats and impacts of invasive plant species to Alberta's natural forests, rangeland and fish and wildlife resources.

## Provincial

### Invasive Alien Species Working Group

In 2006, the Interdepartmental Invasive Alien Species Working Group (Working Group), established in 2005, continued to work under the direction of the Alberta Biodiversity Steering Committee to:

a) Coordinate, align and, where possible, consolidate Government of Alberta legislation, policies, programs, communications and partnerships towards addressing the impacts of invasive alien species.

b) Develop a risk management framework and assessment tool to minimize the impacts of Alberta's current and potential invasive alien species.

c) Provide advice and support towards the Government of Alberta's implementation of the National Invasive Alien Species Strategy and action plans, and other related federal legislation, policies, and programs.

In 2006, most of the Working Group's effort was directed toward the development of the Invasive Alien Species (IAS) Risk Assessment Tool. The first version of the tool was completed this year and it was subsequently peer reviewed. Based on this feedback the development of the tool appears to be moving in the right direction. Plans for 2007 will include further refinements of the tool and a peer review workshop.

### Education, Awareness and Co-operative Initiatives

One significant education and awareness initiative completed this year was the printing of invasive plant awareness signs. Each sign measures approximately 60 cm x 120 cm, and features a suite of three invasive plant species of concern to a specific area in Alberta. The sign also lists a number of tips to help stop the spread of invasive plants. Installation of the signs began in 2006 and will continue in the spring of 2007. To obtain the graphic template of the sign for reproduction, contact the Forest Health Section in Edmonton.

Sustainable Resource Development also continued to contribute to the initiatives of the Alberta Invasive Plants Council (AIPC). In September 2006, the AIPC hosted North American Weed Management Association Conference and Trade Show in Calgary. A capacity crowd of 240 registrants enjoyed presentations by speakers from across Canada and the United States.

# Regional

## Northeast Alberta

Invasive plants continued to be of major concern throughout most areas in Northeast Alberta.

Growing conditions were excellent throughout the season over most of Northeast Alberta. Spring arrived earlier than normal. Many invasive plant species were flowering by early June and the majority matured earlier than normal.

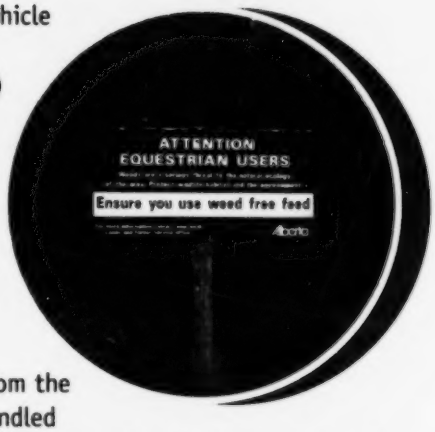
The Northeast Invasive Plant Strategy continued to evolve based on strategy adopted in 2001. As in the previous three years, the ultimate goals in 2006 were to reduce invasive plant populations and restore healthy, native plant communities.

### Education, Awareness and Co-operative Initiatives

Education and awareness remained the top priority to bring the issue of invasive plants to the forefront. Whenever opportunities arose, either formal or informal sessions were conducted where information was shared and publications were distributed.

In a Regional Weed Management Working Group session conducted in Athabasca information was presented dealing with both current and potential noxious weeds. An overview of the 2005 weed program results was also presented. The working groups shared information and promoted cooperative weed management. Through continued effort these groups should generate more interest as invasive species awareness increases and underlying threat of invasive plants becomes apparent.

When Sustainable Resource Development employees conduct weed inventories, they met with company field workers to discuss noxious weeds and their control. This approach was positively received and allowed to develop rapport between government and industry. According to various resource company employees, this technique was very effective at the local level. This same approach was also used with persons involved in recreational activities (campers, off-highway vehicle operators, fishermen etc.) to increase knowledge on weed issues both at a local and a province-wide scale.




All inquiries from the public were handled appropriately either over the telephone or over the counter. The staff of Sustainable Resource Development identified samples of weed species as requested by residents and co-workers.

One weed awareness sign was erected near the south gate of the Cold Lake Air Weapons Range. This is the first of 20 signs that will be placed at strategic locations in 2007.

### Surveys

The first priority was to survey forested Crown lands that are not currently under disposition. There was some follow-up surveying on previously known infestations, and inventories of Crown lands not currently held under disposition, land use dispositions, and timber dispositions. In addition, emphasis was placed on conducting inventories on areas where tall buttercup was known to thrive. Surveys were undertaken along some lakeshores in the region, within the Cold Lake Air Weapons Range and the Richardson Backcountry.

These surveys will guide the future control programs and help to facilitate forthcoming cooperative weed control ventures.

Out of 217 sites inventoried in 2006, 180 were located within the Lac La Biche Area (NE1), whereas 37 were within the Waterways Area (NE2). Out of the sites inventoried, 197 (91%) had noxious weed infestations (in comparison to 87% in 2005, 62% in 2004, 72% in 2003 and 62% in 2002).

Of the noxious weeds sites, 61% had trace, 13% low, 14% moderate and 12% high level of infestation. Corresponding percentages in 2005 were 48%, 28%, 15% and 9% respectively.

On the 197 sites with weeds, 38 (19%) had multiple weed species. In total, 230 species reports were recorded.

Frequency of weed species inventoried, in order from highest to lowest:

- Tall buttercup (*Ranunculus acris*) 28.3%
- Perennial sow thistle (*Sonchus arvensis*) 24.3%
- Scentless chamomile (*Matricaria maritima*) 23.5%
- Canada thistle (*Cirsium arvense*) 11.7%
- Common tansy (*Tanacetum vulgare*) 8.7%
- Oxeye daisy (*Chrysanthemum leucanthemum*) 2.2%
- White cockle (*Lychnis alba*) 1.3%

Regionally, Canada thistle, oxeye daisy and tall buttercup were found in the southern part (Lac La Biche Area) of the region where the frequency of their occurrence has remained about same in the past three years.

Perennial sow thistle surveys were limited to main access roads even though it was present throughout much of the region. These access roads include mainly the primary and secondary highways and access roads into areas used by a multitude of users.

### Control

At 45 locations different invasive species (primarily scentless chamomile but including common tansy, oxeye daisy, tall buttercup, and white cockle) were either hand-picked or dug out. These infestations were controlled regardless of the disposition holder. Three larger scentless chamomile infestations (1000 square meters or more) on unoccupied Crown land were hand-picked. All weeds collected by the Sustainable Resource Development staff were burned at the Athabasca waste transfer site.

Scentless chamomile was handpicked numerous times at the Athabasca Sustainable Resource Development warehouse compound but eventually these invasive plants were controlled by spraying a herbicide.

Numerous locations where the disposition holder had been verbally notified about weed inventory in 2005 were rechecked in 2006. In all but one location control measures had been taken, generally with reasonable success. It was encouraging to see that some major disposition holders were developing and implementing more pro-active programs.

## Northwest Alberta

The Inasive Plant Management Program in Northwest Alberta was expanded in 2006 to include a comprehensive survey of the Lesser Slave Area in addition to Smoky, Upper Hay and Peace areas. The primary objective of the program was to detect restricted and noxious weeds and notify stakeholders if their dispositions contained invasive plants. Secondly, the program focused on re-inspections to ensure stakeholder compliance to weed notifications from the previous year.

### Education, Awareness and Co-operative Initiatives

Several invasive plant identification and control courses were held throughout the Peace Area in the

spring of 2006. Every invasive plant surveyor hired by Sustainable Resource Development attended at least one of these courses. At the beginning of the field season these surveyors were briefed about the season's goals and direction by the Forest Health Officer and the Technician. To increase public awareness Smoky, Upper Hay and Peace areas posted invasive plant awareness signs at various high traffic points.

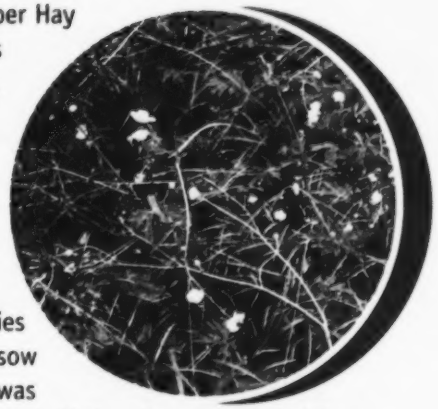
**Surveys and Control**

From mid-June until the end of August, within each Area, one or more seasonal staff members conducted invasive plant surveys.

Within the Slave Lake Area 160 sites were surveyed. The most prevalent species was perennial sow thistle found on 137 (86%) sites, followed closely by Canada thistle on 122 (76%) sites. Other species found included scentless chamomile and cleavers. Multiple species were found on 119 (74%) sites, and 10 (6%) sites did not contain any invasive plants.

Within the Smoky Area 270 sites were surveyed, of which 70 were re-inspections; 184 (68%) of these sites were clean. Canada thistle and scentless chamomile were the most prevalent species found. The surveyors also found few perennial sow-thistle, common tansy, toadflax, tall buttercup and oxeye daisy. Of the 86 sites with weeds 50 were treated in the current season. Weeds were hand-picked at 19 sites that had less than 5 plants. Sustainable Resource Development was responsible for five sites and stakeholders were responsible for 12 sites.

Companies in the Smoky Area comply on average 93% of the time to first time inspections. Communications between the invasive plant surveyor, stakeholders and Municipal Districts were among the best in the Peace Area. This Area also successfully managed three spraying contracts, including one on a Sustainable Resource Development gravel pit and another on a revoked grazing lease.



Within the Upper Hay Area, 494 sites were surveyed, of which 127 were re-inspections and 92 (20%) were clean. The most prevalent species was perennial sow thistle, which was abundant at over half the sites surveyed. Other species found included scentless chamomile, Canada thistle, common tansy and common toadflax. Company response to inspection was very mixed in this area, which may be due in part to the rate at which dispositions change hands and the level of enforcement.

A biological control study was initiated in the Upper Hay and Peace areas to study the northern survival and effectiveness of two potential control agents on scentless chamomile. Scentless chamomile gall midges were released in mid-August at four different locations with an abundance of flowering scentless chamomile plants: a site off Hwy 58 near Chinchaga River; a Lease of Occupation (LOC) south of Rainbow Lake; a Mineral Surface Lease (MSL) in Seal Lake and a private farm near Keg River. In mid-September scentless chamomile weevils were released in the same areas. These insects are expected to reduce scentless chamomile growth and seed dispersal in following years. Sustainable Resource Development will monitor dispersal and survival of these insects.

Within the Peace Area, Forest Officers also participated in some surveys and completed re-inspections. Most of the initial inspections focused on the Municipal District of Clear Hills and Seal Lake. Altogether 271 sites were surveyed, of which 110 were re-inspections and 110 (41%) were clean. The most prevalent species was perennial sow-thistle, followed by Canada thistle and scentless chamomile. Common tansy was found at one location.

Municipality involvement with invasive plant surveys in the green zone of the Peace Area was quite strong. In Northern Sunrise County, approximately 75% of all sites surveyed by the county were clean. Many clean sites were also found in the Municipal District of Northern Lights although complete survey details are still unavailable. Staff shortages in the Municipal District of Clear Hills restricted survey activity in 2006, but they work with Sustainable Resource Development to ensure that an effective program will be in place in 2007.

## Southwest Alberta

### Southern Rockies and Clearwater Areas

A very warm growing season accompanied by regular rainfalls created optimum germination and growing conditions in 2006. Some infestations previously believed to be nearly controlled re-established in 2006.

#### Education, Awareness and Co-operative Initiatives

Fifteen invasive plant signs were erected at recreational staging areas in 2006. Other invasive plant managing agencies were very impressed with the signs and some have purchased signs for their areas.

Co-operative weed management continues to be the first priority in the Clearwater and Southern Rockies areas where leaseholder participation has been high. The Rig Street Co-operative west of Sundre expanded eastward this year with control work completed over a very large area. Spray Lake Sawmills co-operatively managed weeds in the Boggy Lake area together with a grazing lease holder and Fortis. The Municipal District of Ranchland, which does the control work within their district by way of a Memorandum of Understanding with Sustainable Resource Development, achieved some co-operative control work with other leaseholders in the south.

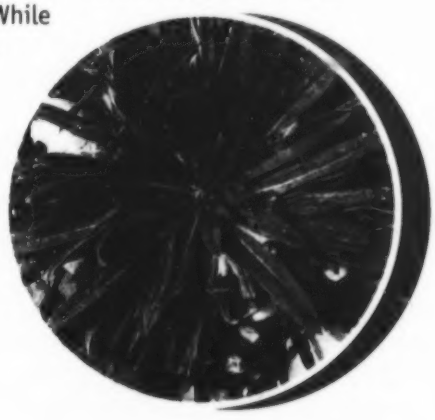
#### Surveys and Control

New infestations of wild caraway continue to pop up along the east slopes. A common pathway for this plant is hay brought in by backcountry horseback riders. A number of riders were approached at staging areas to discuss this issue. Many were aware of the problems caused by 'dirty' hay and had brought in processed feeds.

The field scabious infestation of the Jumping Pound/Sibbald area looked worse in some spots and better in others compared to 2005 infestation. For the past few years Tordon and Transline have been used exclusively, but this season a 2,4-D/Banvel mix and the new herbicide Milestone were tried out. The 2,4-D/Banvel mix seemed to work well on rosettes but not as well on the bolting plants. The plants treated with Milestone curled and finished blooming, but it is hoped that the seeds will not be viable. Efficacy of these two treatments will be determined next season.

Blueweed, common toadflax, oxeye daisy and tall buttercup infestations were widespread in the Crowsnest Pass. These weeds were found infesting nearly any spot without trees, regardless of how little traffic occurred in the area.

Weed containment continued to be the focus in the Castle area. Oxeye daisy, blueweed and common toadflax were widespread throughout this multiple use area. The fire guards of the Lost Creek Fire have become the southern control boundary of this containment. While many of these guards have become infested, others are well vegetated and are free of weeds.



Weed control in the Beaver Creek area of the southern Porcupine Hills continued to improve. The hound's tongue population was slowly decreasing along with other weeds in the area. However, many new hound's tongue sites appeared farther north and this plant is also creeping into the north side of the Pass via infested grazing leases. Removing the seed stalks has proven to be an effective method to control this weed.

**Foothills Area**

The goal of 2006 Foothills Invasive Plants Program was to control the spread of noxious and restricted weeds in the green zone.

### Education, Awareness and Co-operative Initiatives

A number of invasive plant information signs were put up at information kiosks at the heads of multi-use trails. These trails experience heavy horse and All Terrain Vehicle traffic. The remainder of these signs will be installed in the spring of 2007.

Invasive plant pamphlets were distributed to the public by office and field staff in the Foothills Area. Pamphlet boxes at Whitehorse Creek, Berland River Recreation Area, Rock Lake Staging Area, Sulphur Gates and Emerald Lake were also stocked.

A well received invasive plant presentation was delivered to Talisman Energy Inc. construction consultants.

### Surveys and Control

In total 27 sites were inspected in the 2006 season. Most of these inspections were in the vicinity of Highway 40 south.

Five infestation notification letters were sent out to disposition holders in 2006. These letters notified stakeholders of the infestation and asked them to take control actions in a timely manner.

Peppers Lake, Old Rehn Mill, Gregg Cabin and the Entwistle Gravel Pit sites in the Foothills Area were treated with herbicide to control invasive plants.

**Woodlands Area**

The Woodlands Area invasive plant program began in June and was completed in late August, 2006. The bulk of the program was involved in inventorying noxious weed sites and contacting land occupants for notices to control.

### Education, Awareness and Co-operative Initiatives

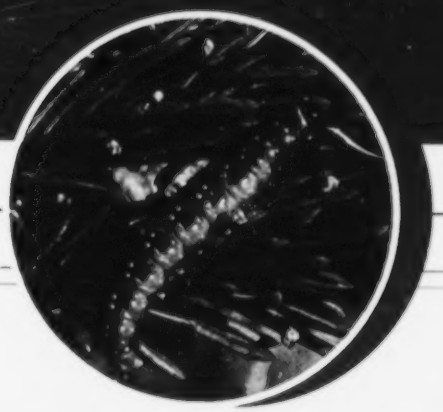
Co-operative control initiatives were undertaken either by Burlington Resources or ConocoPhillips and Millar Western Forest Products. Companies appeared more willing to conduct control action if their neighbours were controlling weeds as well. Sustainable Resource Development facilitated this co-operation by providing, with permission, the locations that were sprayed.

### Surveys and Control

The focus of weed monitoring and inventory in the Woodlands Area was on dispositions held by the oil and gas and forestry industries. Weed inspections were conducted in conjunction with operational inspections on various types of dispositions. Sixty sites were inspected. If weeds were found, the disposition holders were contacted.

There was a large infestation of scentless chamomile in the Chickadee/Baseline Lake area and some tall buttercup infestations in the Groat Creek area. Common tansy and Canada thistle were also discovered on two islands in the Athabasca River. In July 2006, the Junior Forest Rangers picked 56 large garbage bags of weeds on the larger island in one day. In addition, the Junior Forest Rangers picked and bagged all the Canada thistle in the Arboretum of the Huestis Demonstration Forest.

# Forecast on Major Forest Pest Conditions in 2007, in Alberta



## Spruce Budworm

Multi-Pher I® traps (Le Group Biocontrole, Quebec) baited with female budworm sex pheromone lures (Phero Tech Inc., British Columbia) were used to monitor male spruce budworm moth populations in high budworm-risk forest stands. The average count of male moths was used to predict the potential risk of new spruce budworm outbreaks occurring in these stands in 2007. These procedures are described in the "Spruce budworm Management Guide" (Ranasinghe and Kominek, 1998).

Figure 13 shows the provincial outlook on risk of new outbreaks occurring in 2007. A detailed analysis of the data is given below.

### Northeast Alberta

The results of the survey are summarized in Table 10.

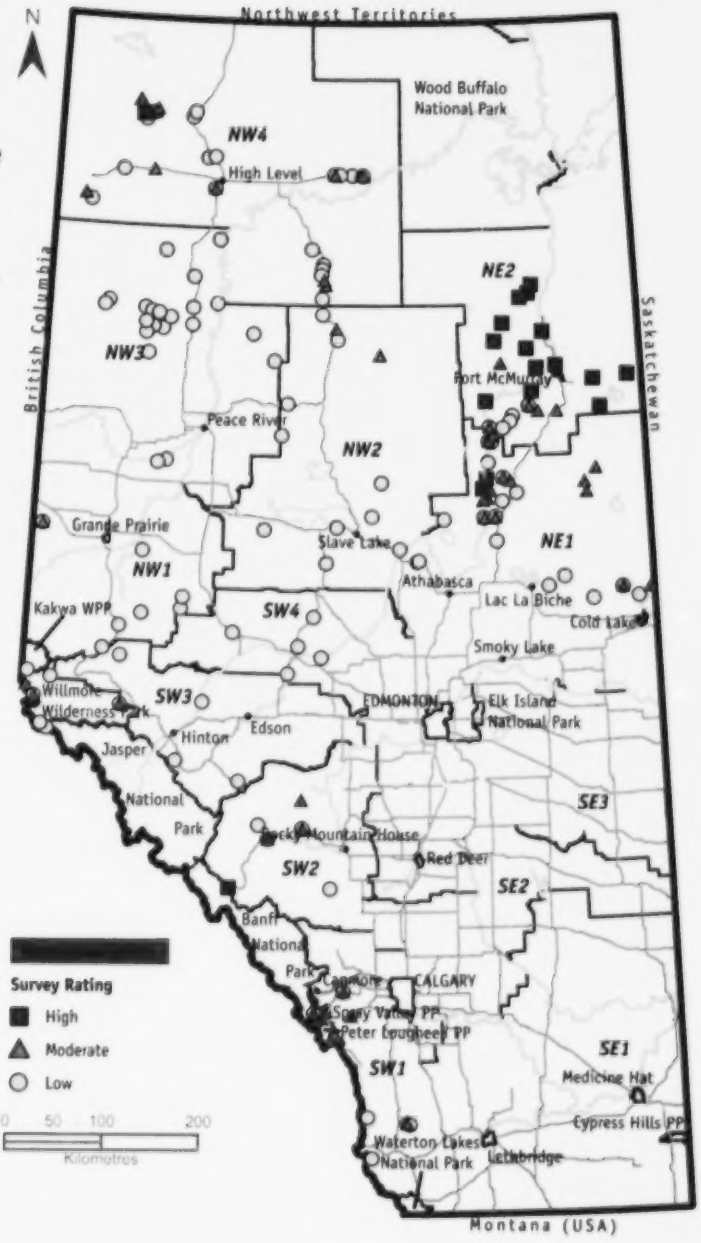



*Figure 13*
Forecast on the risk of new spruce budworm outbreaks occurring in 2007, based on the number of male moths captured in pheromone-baited traps in Alberta in 2006.

***Table 10***
Summary results of the spruce budworm male moth surveys carried out by using pheromone-baited traps in northeastern Alberta, 2006

| Area | Risk of New Outbreaks Occurring in 2007 | | | | | |
|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | |
| | Plots | Moths/trap | Plots | Moths/trap | Plots | Moths/trap |
| Lac La Biche | 12 (44%) | 55-467 | 13 (48%) | 614-1517 | 2 (7%) | 2871-3343 |
| Waterways | 3 (14%) | 130-316 | 8 (36%) | 527-1875 | 11 (50%) | 2047-6127 |

In the Lac La Biche Area (NE1), 28 plots were established; one plot was inactive. The overall risk of new spruce budworm outbreaks occurring in 2007 is low to moderate in this area.

In the Waterways Area (NE2), the overall risk of new outbreaks occurring in 2007 still remains moderate to high. Aerially visible defoliation is likely to occur in the near future at four plot locations where the average trap catches exceeded 4000 moths per trap.

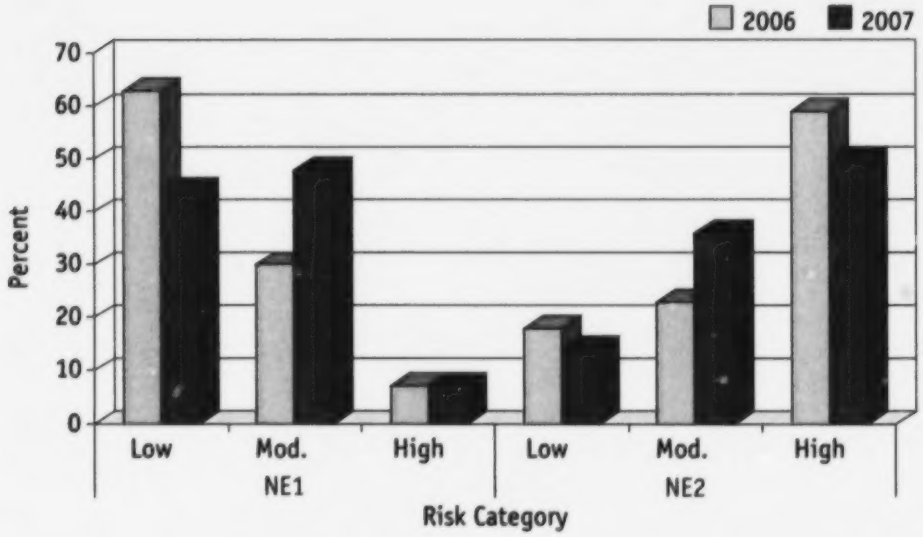



***Figure 14***
Comparison of 2006 vs. 2007 forecasts on the risk of new spruce budworm outbreaks occurring in northeastern Alberta.

## Northwest Alberta

In this region, 128 pheromone-baited plots were established in 2006 in co-operation with Tolko Industries-High Level (50 plots) and Manning Diversified Forest Products (11 plots). Two out of the 128 plots were inactive.

The results of this survey are shown in Figure 13 and Table 11. The overall risk of new outbreaks occurring in this region in 2007 is low. The risk of new outbreaks occurring was low in 98 (78%) plots, moderate in 27 (21%) plots and high in 1 (1%) plot. The breakdown of the number of plots in each risk category in the Smoky, Lesser Slave, Peace and the Upper Hay areas is shown in Table 11.

*Table 11*
Summary results of the spruce budworm male moth surveys carried out by using pheromone-baited traps in northwestern Alberta, 2006

| Area | Risk of New Outbreaks Occurring in 2007 | | | | | |
|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | |
| | Plots | Moths/trap | Plots | Moths/trap | Plots | Moths/trap |
| Smoky | 8 (89%) | 4-379 | 1 (11%) | 620 | 0 | 0 |
| Lesser Slave | 8 (80%) | 58-457 | 2 (20%) | 811-826 | 0 | 0 |
| Peace | 20 (100%) | 13-326 | 0 | 0 | 0 | 0 |
| Upper Hay | 62 (71%) | 15-475 | 24 (28%) | 515-1891 | 1 (1%) | 2534 |

## Southwest Alberta

Thirty plots with pheromone-baited traps were set up as follows in this region in 2006: Southern Rockies Area (8); Clearwater Area (6); Foothills Area (11) and Woodlands Area (5). The trap catches in this region are shown in Figure 13 and in Table 12. As predicted, there were relatively high trap catches in some plots in this region in 2006. The risk of an outbreak occurring in 2007 is low because most of these plots with high catches are infested with the two-year cycle spruce budworm, *C. biennis* Free. High trap catches of two-year cycle budworm are expected in even years and low trap catches are expected in odd years. Thus, low budworm numbers resulting in low risk of new outbreaks are expected in 2007. The risk of new outbreaks occurring in 2008 is moderate to high in one plot located in the Clearwater Area.

This plot had almost 3000 moths per trap (Table 12). Outbreak risk is low-moderate in the Southern Rockies and Foothills areas; risk is nil-low in the Woodlands Area.

*Table 12*
Summary results of the spruce budworm male moth surveys carried out by using pheromone-baited traps in southwestern Alberta, 2006

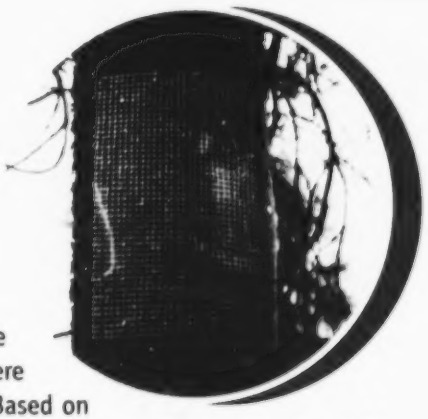
| Area | Risk of New Outbreaks Occurring in 2007 | | | | | |
|---|---|---|---|---|---|---|
| | Nil/Low | | Moderate | | High | |
| | Plots | Moths/trap | Plots | Moths/trap | Plots | Moths/trap |
| Southern Rockies | 3 (38%) | 91-449 | 5 (63%) | 563-1250 | 0 | 0 |
| Clearwater | 2 (33%) | 204-213 | 3 (50%) | 525-771 | 1 (17%) | 2764 |
| Foothills | 8 (73%) | 26-391 | 3 (27%) | 621-1194 | 0 | 0 |
| Woodlands | 1 (20%) | 0 | 4 (80%) | 66-121 | 0 | 0 |

## Mountain Pine Beetle

### Public Lands

Provincial Crown Land

### 2006 Surveys Carried Out by Using Pheromone Baits to Detect Mountain Pine Beetle Incidence



Prior to the mountain pine beetle flight in 2006, ground plots were established to detect presence of beetles in un-infested, high-risk lodgepole pine stands. Each of three mature lodgepole pines per plot was baited with a two-component aggregation pheromone bait (Phero Tech Inc., British Columbia). The results of this survey are shown in Table 13.

Except in Smoky Area, the attack levels were relatively low. Based on these results more widespread beetle attacks could have been expected in the Smoky Area in 2007.

*Table 13*
Mountain pine beetle attacks in pheromone-baited plots in Alberta, 2006

| Area | No. of plots | | Attacks/tree | Spill-over attacks[11] |
|---|---|---|---|---|
| | Total | Attacked | | |
| Smoky | 17 | 17 | 1-150 | 0 |
| Southern Rockies | 10 | 7 | 1-15 | 1 |
| Clearwater | 6 | 2 | 2-69 | 0 |
| Foothills | 87 | 16 | 1-45 | 0 |

[11] Number of attacked trees located outside of the monitoring plot.

In the summer of 2006 there was a huge influx of mountain pine beetles from British Columbia into northern Alberta. These beetles got scattered over a wide area extending from the British Columbia-Alberta border to as far east as Slave Lake and as far north as Rainbow Lake (Figure 15). This will result in a huge increase in the number of faders in these areas in 2007.

This is the first time mountain pine beetle has ever attacked pines in most of this part of the province. This will make detection of green attack difficult in 2007 winter through spring because faders will not appear till 2007 summer. The mountain pine beetle numbers, especially along the fringe of this attack, are forecasted to be low thus resulting in many strip attacks. This will pose an additional challenge in detecting these new attacks. Combined with the availability of susceptible hosts and continued beetle pressure from adjoining areas on the British Columbia side of the border, more new mountain pine beetle infestations are expected to occur in 2007 in southern Alberta.

***Figure 15***
Preliminary estimates of the extent of infestation following a huge mountain pine beetle influx into northern Alberta in the summer of 2006

# Aspen Defoliators

## Forest Tent Caterpillar

Forest tent caterpillar moth populations in northwestern Alberta were monitored by using Unitraps® baited with pheromone lures (Phero Tech Inc., British Columbia). The annual mean trap catches in monitoring plots during the past seven years are shown in Figure 16. These results indicate an upward trend in male moth catches during the past three years corresponding to the increase in the extent of forest tent caterpillar defoliated area. This increasing trend, however, was not apparent in the years preceding the onset of current outbreak in 2004; in fact, there was a declining trend of trap catches in the preceding years (Figure 16). In 2006, there was some reduction in the intensity of forest tent caterpillar defoliation in northwestern Alberta. This may indicate action by the natural enemies of this pest. If this trend continues further reduction in defoliation can be expected in 2007. However, the forest tent caterpillar infestations are expected to increase in extent and intensity in northeastern Alberta in 2007.

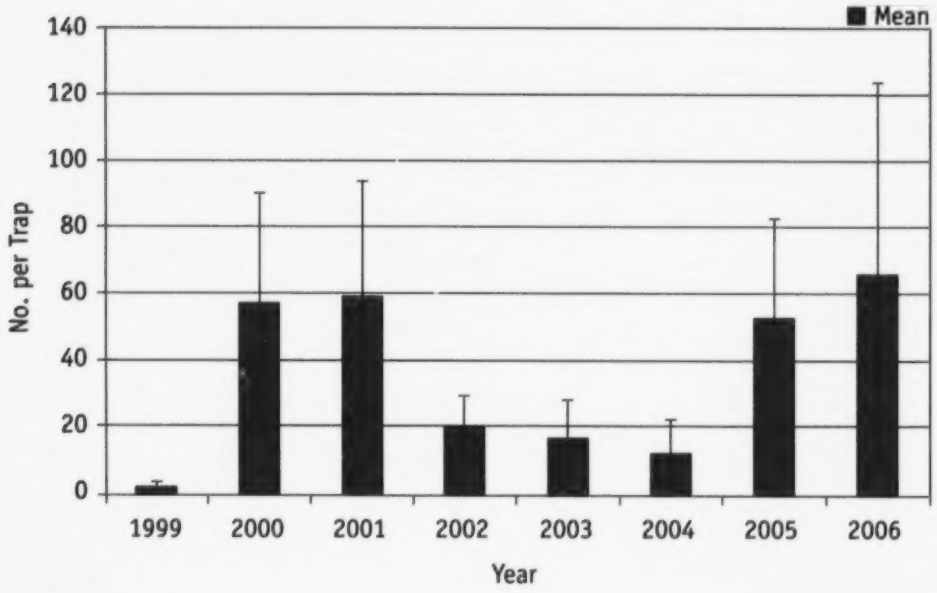



***Figure 16***
Forest tent caterpillar male moth catches in pheromone-baited traps deployed in northwestern Alberta, 1999-2006

# Exotic Pests

## Gypsy Moth

The Forestry Division of the Sustainable Resource Development set up 74 traps scattered over the forested Crown land of the province as a part of the annual survey conducted by the Canadian Food Inspection Agency (CFIA). Delta traps baited with Dispalure® were used for this survey. No gypsy moths were found in these traps. Therefore there is no risk of gypsy moth incidence at these 74 trap locations in 2007.

# General Education, Increased Awareness and Training

## Provincial

### Provincial Integrated Forest Pest Management Forum

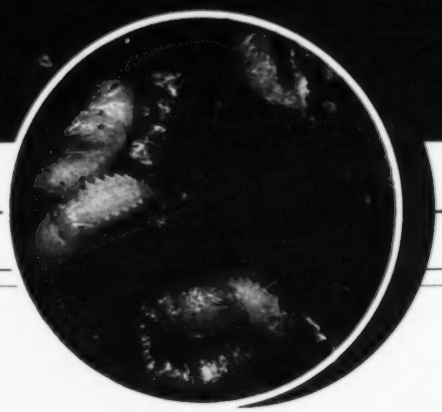
The tenth annual Integrated Forest Pest Management Forum was held on November 7, 2006 at the Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada in Edmonton. The proceedings included updates of forest pest conditions and forest health research in the province. Dr. Lorraine Maclauchlan, Forest Entomologist, British Columbia Forest Service, Southern Interior Region, Kamloops, British Columbia delivered the keynote address entitled "Heading East: Tales of How the West Was Won – Insight from British Columbia on the changing dynamics, impacts and management challenges posed by the mountain pine beetle." The proceedings of this forum are posted on the website at: www.srd.gov.ab.ca/forests/health/cooperators/pestmanagement

### Forest Health Web Site

The internal and external forest health web sites were regularly updated. The updates included forest health conditions and maps; *Bugs and Diseases* newsletter; annual report; Integrated Forest Pest Management Forum proceedings and forest health survey data. In addition to the regular updates, the Ministerial Order prohibiting importation of pine with bark, news releases, updates on mountain pine beetle operations in Willmore Wilderness Park and Bow Valley were included. Legislation and info sheets on invasive plants, and guidelines on pesticide, bark beetle pheromone and biological control use also were posted on this website. The external web site address is: www.srd.gov.ab.ca/forests/health/default

### 14th Annual Alberta/British Columbia Intermountain Forest Health Workshop

Parks Canada hosted this annual workshop held on April 19-21, 2006 at Radium Hot Springs in British Columbia. The objective of this workshop was to provide a forum for provincial and federal agencies involved in forestry and industry to share and discuss primary forest health monitoring, research, management initiatives and/or issues of concern along the Alberta/British Columbia border. Topics included insect and disease concerns as well as those of invasive plants. The proceedings of this workshop are available at the website: http://abbc.cricketworks.com



## Mountain Pine Beetle

In 2006, Alberta Sustainable Resource Development supported a number of mountain pine beetle-related research projects. These included preparing a synopsis of research that has been conducted, is ongoing or planned on the impact of the mountain pine beetle on caribou; an ongoing two-year study to find potential overwintering survival of beetle life stages in wood waste generated in processing of infested wood, and the use of composting in controlling these life stages; feasibility of using snow cache to extend the deck life of beetle-infested wood; use of synoptic weather monitoring, aerial sampling, radar and sodar measurements to track long-distance beetle dispersal; and, impact of mountain pine beetle outbreaks and application of beetle mitigating tactics on grizzly bears.

# References

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## Appendix I

### Forest Areas of Alberta, December 2006

## Appendix I

**Forest Areas of Alberta, December 2006**

# Appendix II

## INFORMATION ON OPERATIONAL USE OF PHEROMONES IN ALBERTA, 2006

### FOREST TENT CATERPILLAR

| | |
|---|---|
| Chemical component(s): | Z5, E7 – dodecadienal |
| Lure type: | Flexlure® |
| Trap type: | Uni-trap® |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

### GYPSY MOTH

| | |
|---|---|
| Chemical component(s): | (+)cis-7, 8-epoxy-2-methyloctadecane |
| Lure type: | Disparlure® |
| Trap: | Delta sticky trap |
| Pheromone source: | Trécé Inc., Salinas, California (purchased and distributed by Canadian Food Inspection Agency) |

### MOUNTAIN PINE BEETLE

| | |
|---|---|
| Chemical component(s): | trans-verbenol, exo-brevicomin |
| Lure type: | Pre-packed tree-bait |
| Trap: | not applicable |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

### SPRUCE BUDWORM

| | |
|---|---|
| Chemical component(s): | 95% E-11-tetradecenal, 5% Z-11-tetradecenal |
| Lure type: | Plastic lure |
| Trap type: | Multi-Pher I® |
| Pheromone source: | Phero Tech Inc., Delta, British Columbia |

# Appendix III

## Names of Invasive Plant Species that Commonly Occurred in 2006 on forested Crown land in Alberta

| Common Name | Scientific Name |
|---|---|
| Bull thistle | Cirsium vulgare (Savi.) Ten. |
| Canada thistle | Cirsium arvense (L.) Scop. |
| Common tansy | Tanacetum vulgare L. |
| Toadflax | Linaria vulgaris Hill. |
| Field scabious | Knautia arvensis (L.) Duby |
| Hound's tongue | Cynoglossum officinale L. |
| Nodding thistle | Carduus nutans L. |
| Orange hawkweed | Hieracium aurantiacum (L.) |
| Oxeye daisy | Chrysanthemum leucanthemum L. |
| Perennial sow thistle | Sonchus arvensis L. |
| Scentless chamomile | Matricaria perforata Merat. |
| Tall buttercup | Ranunculus acris L. |
| White cockle | Silene alba (Mill.) E. H. L. Krause |
| Wild caraway | Carum carvi L. |